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# **New York State Energy Conservation Construction Code**

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**With Amendments**  
*Effective March 1, 1991*

**New York State Department of State**  
Division of Code Enforcement & Administration  
41 State Street, Suite 1130  
Albany, NY 12231

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The New York State Energy Conservation Construction Code, which first became effective on Jan 1, 1979, sets minimum standards for the design and construction of all new buildings and the substantial renovation of existing buildings throughout New York State. For information on the requirements of the Energy Code, please contact your local code enforcement official or:

New York State Department of State  
Division of Code Enforcement and Administration  
41 State Street, Suite 1130  
Albany, NY 12231

1-518-474-4073

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# **New York State Energy Conservation Construction Code**

This information is not the official version of the Official Compilation of the Rules and Regulations of the State of New York (NYCRR). No representation is made as to its accuracy, nor may it be read into evidence in New York State Courts. To ensure accuracy and for evidentiary purposes, reference should be made to the official NYCRR.

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## **Amendments to the New York State Energy Conservation Construction Code**

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Effective February 12, 1992, the requirements of the New York State Energy Conservation Construction Code as it pertains to combination space/service water heating boilers were amended. These amendments, highlighted herein, supersede requirements effective March 1, 1991.

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## 7813.12 Design of HVAC Systems

- (a) The design conditions specified in Part 7811 of this Code shall apply for all calculations.
- (b) Calculation procedures. For the purpose of sizing HVAC systems, heating and cooling design loads, including the impact of infiltration, shall be determined in accordance with generally accepted engineering standards.
- (c) ***The contractor shall provide a copy of the heating design load calculations required under subdivision (b) to the building owner or his representative at the time replacement of gas- or oil-fired combustion heating equipment is proposed.***

## 7813.32 Service Water Heating Equipment

- (a) Water heaters, including pool heaters, shall comply with the performance requirements specified in Table 4-12.
- (b) Combination space and service water heating boilers ***less than 300,000 Btu/hr.***
  - (1) ***Except as provided in paragraph (2) below, combination space and service water heating boilers having a heat input rate of less than 300,000 Btu/hr.*** may only be used in conjunction with an unfired hot water storage tank, and only when the following conditions are met:
    - (i) The boiler must meet the minimum performance requirements specified in Table 4-5, and
    - (ii) The unfired hot water storage tank must be insulated to provide an R-value of no less than R-6, ***and shall have sufficient volume to permit appropriate sizing of the boiler for the heating design loads.***
  - (2) ***For the replacement or substantial renovation of an existing combination space and service water heating boiler in a residential building, an unfired hot water storage tank shall not be required where the boiler has a heat input rate of less than 300,000 Btu/hr and meets the minimum performance requirements specified in Table 4-5.***
  - (3) ***For new residential buildings, compliance with the requirements of paragraph (1) may be demonstrated alternatively by the use of a boiler having an AFUE of no less than 83%.***
- (c) ***Combination space and service water heating boilers 300,000 Btu/hr or greater. Combination space and service water heating boilers having a heat input rate of 300,000 Btu/hr or greater shall have a standby loss less than***

$$W = \frac{13.3 \text{ pmd} = 400}{n}$$

***W = standby loss in Btu/hr determined for a test period of 24 hours duration while maintaining a boiler water temperature of 90°F above ambient.***

***pmd = probable maximum hourly demand in gallons of hot water per hour.***

***n = the fraction of the year when the outdoor daily mean temperature is more than 64.9°F.***

### **7815.10 Design of HVAC Systems**

***The design of all HVAC systems shall meet the requirements of Section 7813.12 of this Code.***

The amended requirements are indicated in ***bold italics***.

## Table of Contents

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<b>Part 1</b>		<b>Page</b>
7810	General Provisions.....	1
7810.1	Title.....	1
7810.2	Purpose and Intent.....	1
7810.3	Effective Date.....	1
7810.4	Other Statutes and Codes.....	1
7810.5	Partial Invalidity.....	2
7810.6	Scope.....	2
7810.7	Maintenance Information.....	3
7810.8	Testing Procedures or Standards.....	3
7810.9	Administration and Enforcement.....	4
7810.10	Local Energy Conservation Construction Code.....	4
7810.11	Compliance Documentation.....	4
7810.12	Information Concerning Code Requirements.....	4
7810.13	Interpretation of Code Requirements in Cases of Specific Construction.....	5
7810.14	Allowance of Variance in Cases of Specific Construction.....	6
7810.15	Penalties.....	6
7810.16	Definitions.....	6
<b>Part 2</b>		
7811	Design Conditions.....	15
7811.1	Scope.....	15
7811.2	Outdoor Design Conditions.....	15
7811.3	Indoor Design Conditions.....	15
7811.4	Ventilation.....	15

<b>Part 3</b>		<b>Page</b>
7812	Alternate Building Design by Annual Energy Analysis.....	19
7812.1	Scope.....	19
7812.2	Analysis Criteria.....	19
7812.3	Analysis Procedure.....	19
7812.4	Documentation.....	20
 <b>Part 4</b>		
7813	Building Design by Component Performance.....	21
7813.1	Scope.....	21
	<b>Building Envelope Systems</b>	
7813.2	General Criteria.....	21
7813.3	Thermal Performance of Envelope Systems.....	21
7813.4	Air Infiltration of Envelope Systems.....	23
7813.5	Fireplaces.....	24
	<b>Building HVAC Systems and Equipment</b>	
7813.11	General.....	24
7813.12	Design of HVAC Systems.....	24
7813.13	Control of HVAC Systems.....	24
7813.14	Reset of HVAC Systems.....	25
7813.15	Economizer Cycle of HVAC Systems.....	25
7813.16	Ventilation Systems.....	26
7813.17	HVAC Pumping Equipment.....	26
7813.18	Insulation of Piping Systems.....	26

## Table of Contents

---

		<b>Page</b>
7813.19	Insulation of Duct Systems.....	28
7813.20	Sealing of Duct Systems.....	28
7813.21	Performance of HVAC Equipment.....	28
	<b>Building Service Water Heating Systems and Equipment</b>	
7813.31	General.....	32
7813.32	Service Water Heating Equipment.....	32
7813.33	Insulation of Storage Tanks and Piping Systems.....	32
7813.34	Control of Service Water Heating Systems.....	33
	<b>Building Electrical and Lighting Systems and Equipment</b>	
7813.51	General.....	33
7813.52	Electrical Equipment and Systems.....	33
7813.53	Lighting Equipment.....	34
7813.54	Lighting Systems.....	38
 <b>Part 5</b>		
7814	Building Design by Acceptable Practice.....	41
7814.1	Scope.....	41
7814.2	Building Envelope Systems.....	41
7814.11	Performance of HVAC Equipment.....	43
7814.12	Control of HVAC Systems.....	43
7814.13	Duct Systems.....	43
7814.14	Ventilation Systems.....	43
7814.15	Insulation of Piping Systems.....	43
7814.21	Service Water Heating Systems and Equipment.....	43
7814.31	Electrical Systems.....	44

## Table of Contents

---

	<b>Page</b>
<b>Part 6</b>	
7815 Building Design by Thermal Rating Method.....	47
7815.1 Scope.....	47
7815.2 Building Envelope Systems.....	47
7815.3 Methodology.....	47
7815.11 Performance of HVAC Equipment.....	48
7815.12 Control of HVAC Systems.....	48
7815.13 Duct Systems.....	49
7815.14 Ventilation Systems.....	49
7815.15 Insulation of Piping Systems.....	49
7815.21 Service Water Heating Systems and Equipment.....	49
7815.31 Electrical and Lighting Systems and Equipment.....	49
<b>Part 7</b>	
7816 Testing Standards.....	81
7816.1 Scope.....	81
7816.2 Public Inspection.....	81
7816.3 Private Publisher.....	81
7816.4 US DOE.....	81
7816.5 Testing Standards.....	81

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# Part 1

## 7810 General Provisions

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### 7810.1 Title

This Subchapter, promulgated pursuant to Article 11 of the Energy Law of the State of New York, shall be known as the State Energy Conservation Construction Code. It is hereinafter referred to as "this Code".

### 7810.2 Purpose and Intent

- (a) The purpose of this code is to provide statewide uniform regulations for the design of building envelopes to ensure adequate thermal performance; and for the design and selection of mechanical, electrical, and lighting systems and equipment which will enable the efficient use of energy in all new and renovated public and private building construction in New York State.
- (b) It is intended that these regulations provide flexibility to permit the use of innovative approaches and techniques to achieve efficient utilization of energy in an economically reasonable manner.

### 7810.3 Effective Date

- (a) This Code shall take effect on March 1, 1991.
  - (1) With respect to buildings for which a building permit is required, this Code shall be applicable to construction for which either a permit application is made or plans for such construction are filed on or after March 1, 1991.
  - (2) With respect to other buildings, this Code shall be applicable to construction for which contract documents are released for public bid on or after March 1, 1991.
- (b) Construction to which this Code is not applicable, pursuant to (a) above, shall remain subject to the provisions of the State Energy Conservation Construction Code in effect on February 28, 1991.

### 7810.4 Other Statutes and Codes

This Code shall not be construed to abrogate or lessen any requirement appearing in any state, county, city, town or village statute, ordinance or regulation affecting safety or health, including but not limited to the New York State Multiple Dwelling Law, the Administrative Code of the City of New York and the New York State Uniform Fire Prevention and Building Code.

## 7810.5 Partial Invalidity

If any term, part, provision, section, paragraph, subdivision, table or chart of this Code shall be held unconstitutional, invalid or ineffective in whole or part, such determination shall not be deemed to invalidate any remaining terms, parts, provisions, sections, paragraphs, subdivisions, tables or charts of this Code.

## 7810.6 Scope

- (a) This Code sets forth minimum requirements for the design of all new buildings, or portions thereof, and additions to or substantial renovations of existing buildings. This Code regulates building envelopes, HVAC, service water heating, electrical, and lighting systems and equipment for efficient use of energy.
- (b) Buildings shall be designed to comply with the requirements of either Part 7812, 7813, 7814 or 7815 of this Code, as appropriate.
- (c) Exempt Buildings.
  - (1) Buildings that do not contain a conditioned space are exempt from this Code.
  - (2) Buildings that do not use either electricity or fossil fuel for comfort conditioning are exempt from this Code. For purposes of determining whether this exemption applies, a building will be presumed to be heated by electricity, even in the absence of equipment used for electric comfort heating, whenever the building is provided with electrical service in excess of one hundred amps, unless the code enforcement official determines that this electrical service is necessary for purposes other than providing electric comfort heating.
  - (3) Historic buildings are exempt from this Code. This exemption shall apply to those buildings that are listed on The National Register of Historic Places, The State Register of Historic Places, or to buildings which have been determined to be eligible for listing on the National Register by the Secretary of the Interior or on the State Register by the Commissioner of Parks, Recreation, and Historic Preservation. This exemption shall also apply to those buildings which have been designated as historically significant by a local governing body that is authorized to make such designations.
- (d) Application to existing buildings.
  - (1) Additions to existing buildings. Additions to an existing building shall conform to those requirements of this Code that apply to the building equipment or systems being installed in conjunction with the addition. Compliance with this requirement may be demonstrated in one of three ways:
    - (i) The addition alone must comply with the Code;
    - (ii) The addition, together with the entire existing building, must comply with this Code;
    - (iii) The annual energy usage of the addition, together with the entire existing building, does not exceed the annual energy usage of the existing building alone before the addition.

- (2) Substantial Renovation of Existing Buildings. Whenever more than 50 percent of any building system, measured in units appropriate to that system, is replaced within any twelve-month period, that portion of any such building system which is replaced shall be made to conform to the provisions of this Code. Systems or portions of systems not replaced by the renovation are not required to conform, except as noted in paragraph (3) below. Systems most commonly affected by this requirement include, but are not limited to, the following: exterior wall, roof/ceiling, floor, slab, piping, ductwork, lighting, furnace, boiler, air conditioner, heat pump, chiller, package terminal air conditioner and water heater.
- (3) Special Conditions.
- (i) Whenever the inside surface construction of an exterior wall is replaced, insulation shall be added to bring the total insulation R-value of that portion of the wall to no less than R-10.
  - (ii) In residential buildings, whenever more than 50 percent of the existing glazing area is replaced, the U-value for the replacement glazing shall be no greater than 0.58.
  - (iii) For buildings other than residential buildings, whenever more than 50 percent of the existing glazing area is replaced, the shading coefficient for the replacement glazing shall be no less than the  $SC_o$  in Table 4-2.
  - (iv) For buildings constructed after January 1, 1979, whenever less than 50 percent of any building system measured in units appropriate to that system is altered or replaced, such alteration or replacement shall not result in non-compliance with the Energy Code in effect on the date of construction of such building.
- (e) Special Applications to Industrial Process Equipment.
- (1) Energy required for the operation or direct support of any industrial process equipment shall not be considered for any purpose under this Code.
  - (2) In the case of any building or portion thereof in which industrial process equipment produces an internal heating or cooling load, the requirements applicable to the thermal performance of the building envelope may be modified to take such internal load account.

### **7810.7 Maintenance Information**

The contractor shall provide maintenance information for all equipment that requires routine maintenance for efficient operation or energy performance.

### **7810.8 Testing Standards**

For the purpose of determining compliance with this Code, the testing standards specified in Part 7816 of this Code or otherwise prescribed by the Commissioner of the State Energy Office shall be utilized. The standard rating conditions specified in such testing standards shall be utilized to determine compliance.

### **7810.9 Administration and Enforcement**

- (a) The administration and enforcement of the provisions of this Code within any municipality shall be the responsibility of that government entity which is responsible for the administration and enforcement of the provisions of the Building Construction Code or the Fire Prevention and Building Construction Code applicable within such municipality.
- (b) This Code shall be administered and enforced in the manner prescribed by applicable local law or ordinance or the procedures adopted pursuant to section three hundred eight one of the Executive Law for the administration and enforcement of the State Uniform Fire Prevention and Building Code.

### **7810.10 Local Energy Conservation Construction Codes**

- (a) Nothing in this Code shall be construed to abrogate or impair the power of any municipality to promulgate and enforce a local energy conservation construction code more stringent than this Code, or to enforce the provisions of any other local building regulations, provided that such provisions are not inconsistent with this Code.
- (b) Any municipality which adopts a local energy conservation construction code shall file a copy of such and any amendments or revisions thereof with the Commissioner of the State Energy Office within 30 days after promulgation or adoption of such code, amendments or revisions.
- (c) Any local energy conservation construction code, and any amendments or revisions thereof, determined by the Commissioner to be less stringent than this Code shall be unenforceable.

### **7810.11 Compliance Documentation**

- (a) When plans or specifications bear the seal and signature of a licensed professional, such licensed professional shall also include a written statement that to the best of his/her knowledge, belief and professional judgment, such plans or specifications are in compliance with Code.
- (b) Whenever plans or specifications are submitted in connection with applications for building permits, such plans or specifications shall show all data and features of the building, the equipment, and the systems in sufficient detail to permit an evaluation of such plans or specifications by the code enforcement official.
- (c) Documents relating to the proposed construction, which contain information necessary to verify compliance with this Code, such as calculations, worksheets, compliance forms, vendor literature or other documents, shall be made available when requested by the code enforcement official to permit an evaluation of such documents.

### **7810.12 Information Concerning Code Requirements**

Upon written request, the Commissioner of the State Energy Office may provide information concerning any requirement or standard of this Code. Any information so provided shall not be considered an interpretation of Code requirements as provided for in section 7810.13.

### **7810.13 Interpretation of Code Requirements in Cases of Specific Construction**

- (a) Upon written request by a building permit applicant and/or a code enforcement official, the Commissioner of the State Energy Office may issue an interpretation of the application of any specific requirement of this Code to the proposed construction for which an application for a building permit and required plans and specifications have been filed, and concerning which there is a disagreement between the building permit applicant and the code enforcement official as to the application of such specific requirement to the proposed construction.
- (b) A request for an interpretation shall be signed by the building permit applicant and the code enforcement official, or by one or the other individually, and shall include the following information in order to be considered complete:
  - (1) Name, address, and telephone number of the building permit applicant and the code enforcement official;
  - (2) A detailed description of the proposed construction, including a copy of the building permit application and plans and specifications which have been filed by the building permit applicant with the code enforcement official and any other floor plans, elevation, cross-sections, details, specifications, or construction documents necessary to adequately describe the proposed construction;
  - (3) Identification of each requirement of this Code for which an interpretation is requested;
  - (4) A concise summary of the disagreement concerning the application of each such requirement for which an interpretation is requested; and
  - (5) A copy of the building permit application denial if one was issued by the code enforcement official.
- (c) If the request is incomplete or does not otherwise contain sufficient information on which to issue an interpretation, the Commissioner may request clarification of the information provided or additional information necessary to issue the requested interpretation.
- (d) Upon receipt of a complete request for an interpretation signed by only the building permit applicant or the code enforcement official, the Commissioner shall provide written notification to the party who has not signed the request for an interpretation that such request for an interpretation has been filed with the State Energy Office. The party receiving such notification shall have 20 days from the date of such notification in which to provide, in writing, any comments or additional information pertaining to the request for an interpretation; provided, however, that the Commissioner may waive this deadline when warranted by extenuating circumstances.
- (e) The commissioner shall either issue the interpretation or provide notification of the intent not to issue an interpretation to the building permit applicant and the code enforcement official within 45 days of any of the following:
  - (1) Receipt of a complete request for an interpretation signed by both the building permit applicant and the code enforcement official;
  - (2) Receipt of comments when the request for an interpretation is signed by only one party; or

- (3) The expiration of the 20-day comment period when the request for an interpretation is signed by only one party.
- (f) Subsequent enforcement of this Code with respect to the construction project for which an interpretation has been requested shall be consistent with the interpretation issued by the commissioner.

**7810.14 Allowance of Variance in Cases of Specific Construction**

Any standard or requirement of this Code may be varied or modified, in whole or part, with regard to specific elements of construction, upon application made by or on behalf of an owner to the Commissioner of the State Energy Office, where it is found that strict compliance would entail practical difficulty or cause unnecessary hardship in relation to such construction. Any such variance or modification shall, however, provide for alternative energy conservation standards or requirements to achieve, to the extent practicable, the purposes of this Code.

**7810.15 Penalties**

Any person served with an order, pursuant to the provisions of any local law or ordinance, or the procedures adopted pursuant to section 381 of the Executive Law for the administration and enforcement of the State Uniform Fire Prevention and Building Construction Code, who shall fail to comply with such order within 30 days after such service or within the time fixed by such order for compliance, whichever is greater, and any owner, builder, architect, engineer, contractor, or subcontractor taking part or assisting in the construction or use of any building who knowingly violates any applicable provisions of this Code or any lawful order of the governmental entity responsible for the administration and enforcement thereof, shall be subject to a fine of not more than \$500 or to imprisonment of not more than 30 days in jail, or both. Except as otherwise provided by law, any such violation shall not be a crime and the penalty or punishment imposed therefor shall not be deemed for any purpose a penal or criminal penalty or punishment, and shall not impose any disability upon or affect or impair the credibility as a witness, or otherwise, of any person convicted thereof.

**7810.16 Definitions**

(a) Application of Abbreviations, Terms

- (1) For the purposes of this Code, the meaning of the following abbreviations, terms, and their derivatives, shall be as set forth in this section.
- (2) Words used in the singular include the plural, and the plural include the singular.

(b) Abbreviations

- AC - Alternating current
- AFUE - Annual fuel utilization efficiency
- ANSI - American National Standards Institute
- ARI - Air Conditioning and Refrigeration Institute
- Btu - British thermal unit
- c - Capacity
- CE - Combustion efficiency

CFM	- Cubic feet per minute
COP	- Coefficient of performance
CRI	- Color rendering index
db	- Dry bulb temperature
EER	- Energy efficient ratio
EF	- Energy factor
Ent	- Entering
F	- Fahrenheit
Hg	- Mercury
HID	- High intensity discharge
hp	- Horsepower
hr	- Hour
HSPF	- Heating seasonal performance factor
HVAC	- Heating, ventilating and air conditioning
IEEE	- Institute of Electrical and Electronics Engineers
in	- Inch
lb	- Pound
lin	- Linear
LPL	- Lighting power limit
LPW	- Lumens per watt
max	- Maximum
min	- Minimum
mph	- Miles per hour
nsf	- Net square feet
RCR	- Room cavity ratio
rpm	- Revolutions per minute
SC	- Shading coefficient
SEER	- Seasonal energy efficiency ration
SL	- Standby loss
sq ft	- Square foot
TE	- Thermal efficiency
TLE	- Total luminaire efficiency
USDOE	- United States Department of Energy
V	- Volume
W	- Watts

(c) Terms

- (1) **ACCESSIBLE.** (as applied to building mechanical equipment) Permitting close approach and not guarded by locked doors, elevation or other effective means.
- (2) **ACCESSIBLE.** (a applied to building lighting) Located so that a person using or activating a control device can see the controlled lights or the building area lit.
- (3) **ADDITION.** An increase in or extension to any building systems or equipment.
- (4) **AIR CONDITIONER.** A combination of components including a compressor, a condenser and an evaporator or cooling coil which is designed for the purpose of conditioning air for one or more rooms of a building, by providing one or more of the following functions: cooling, heating, air-circulation or air-cleaning.
- (5) **AIR-HANDLING UNIT.** A combination of components designed to condition air for one or more rooms of a building, by providing one or more of the following functions: cooling, heating, air-circulation or air-cleaning.

- (6) AMBIENT CONDITIONS. Outdoor climate conditions including such factors as temperature range, humidity, wind and solar heat gain.
- (7) ANNUAL FUEL UTILIZATION EFFICIENCY (AFUE). The overall efficiency of a furnace or boiler over a complete heating season.
- (8) AUTOMATIC. Self-acting; operating by an internal mechanism when actuated by some impersonal influence, such as a change in current strength, pressure, temperature or mechanical configuration.
- (9) BALLAST. A device used with an electric-discharge lamp to obtain the necessary circuit conditions (voltage, current and waveform) for starting and operating the lamp.
- (10) BALLAST EFFICIENCY FACTOR (BEF). The ratio of relative light output to the power input.
- (11) BASEMENT/CELLAR. That space of a building which is partially or entirely below grade.
- (12) BOILER. Any gas- or oil-fired low pressure self-contained appliance intended for use in heating water or producing steam primarily to provide comfort conditioning.
- (13) BRITISH THERMAL UNIT (Btu). A measure of heat energy; the amount of heat required to raise the temperature of a pound of water by one degree F.
- (14) BUILDING. Any combination of materials, whether portable or fixed, having a roof to form a structure which is heated or cooled in the normal course of affording shelter for people, animals or property, including any equipment therein. The word building shall include factory manufactured homes.
- (15) BUILDING ENVELOPE. The elements of a building that enclose conditioned spaces and through which thermal energy may be transferred to or from the exterior or an unconditioned space.
- (16) CENTRAL AIR CONDITIONER. Any air conditioner which is not a heat pump, room air conditioner or a packaged terminal air conditioner.
- (17) CODE ENFORCEMENT OFFICIAL. The official authorized to act on behalf of the government entity responsible for the administration and enforcement of this Code.
- (18) COEFFICIENT OF PERFORMANCE (COP)-Cooling. The ratio of the rate of net heat removal to the rate of total energy input, expressed in consistent units.
- (19) COEFFICIENT OF PERFORMANCE (COP)- Heating. The ratio of the rate of net heat supply to the rate of total energy input, expressed in consistent units.
- (20) COLOR RENDERING INDEX (CRI). A measure of the degree of color shift objects undergo when illuminated by the light source as compared with the color of those same objects when illuminated by a reference source of comparable color temperature.
- (21) COMBUSTION EFFICIENCY (CE). The steady state efficiency obtained from a combustion process represented by 100 percent minus stack losses expressed as a percent of heat input. Stack losses are:
  - (i) loss due to sensible heat in dry flue gas;

- (ii) loss due to incomplete combustion; and
  - (iii) loss due to sensible and latent heat in moisture formed by combustion of hydrogen in the fuel.
- (22) COMFORT CONDITIONING. The use of energy for heating, cooling, humidifying, dehumidifying or ventilating within a building.
- (23) COMPACT FLUORESCENT LAMP. A fluorescent lamp of a small compact shape, with a single base that provides the entire mechanical support function.
- (24) CONDITIONED FLOOR AREA. The combined floor area of all conditioned space on all floors as measured from the interior surfaces of the walls of the building envelope.
- (25) CONDITIONED SPACE. Enclosed space that is directly or indirectly provided with a positive heating or cooling supply capable of maintaining a temperature above 50°F at winter outdoor design conditions or below 90°F at summer outdoor design conditions.
- (26) CONSTRUCTION. The construction of a new building, or any addition to, or substantial renovation of, an existing building.
- (27) COOLING CAPACITY. The quantity of heat in Btus which an air conditioner is capable of removing from an enclosed space in one hour, expressed in Btu/hr.
- (28) DEADBAND. A temperature range within which the conditioned space temperature may fluctuate without the use of energy for either heating or cooling.
- (29) DEGREE DAY, HEATING. The product of temperature difference and time, used in estimating heat loss from a building in winter. For any one day, when the mean temperature is less than 65°F, there exists as many degree days as there are Fahrenheit degrees difference in temperature between the mean temperature for the day and 65°F.
- (30) DWELLING UNIT. One or more rooms providing complete, independent living facilities for one or more non-transient persons, including provision for living, cooking, sanitation, and sleeping facilities.
- (31) ELECTRIC COMFORT HEATING. The provision of a positive heating supply to maintain temperature above 50°F at winter outdoor design conditions by any equipment that utilizes electricity as the primary means to produce heat, other than a heat pump which meets the requirements of Table 4-6 or a packaged terminal heat pump which meets the requirements of Table 4-7.
- (32) ELECTRIC METER. A mechanical/electrical device which can individually measure the electricity consumed by each dwelling unit and which is owned and operated by the electric utility.
- (33) ELECTRIC MOTOR. A rotating machine that transforms electrical energy into mechanical energy.
- (34) ENERGY. The capacity for doing work. It takes a number of forms which may be transformed from one into another, such as thermal (heat), mechanical (work), electrical, and chemical. Customary measurement units are kilowatt hours (kwh) or British thermal units (Btu).

- (35) ENERGY-EFFICIENCY RATIO (EER). The ratio of the cooling capacity in Btu/hour to the electric input in watts.
- (36) ENERGY FACTOR. The overall efficiency of a water heater based on its recovery efficiency, standby loss, and any auxiliary power input.
- (37) EQUIPMENT. Mechanical devices for comfort conditioning or for domestic or sanitary water heating including, limited to, furnaces, boilers, air conditioners, heat pumps, chillers, and water heaters, and elevators, escalators, or other mechanical additions or installations. This term does not include any equipment constituting an industrial or commercial process.
- (38) FLUORESCENT LAMP. A low pressure electric discharge lamp in which a phosphor coating transforms some of the ultraviolet energy generated by the discharge into light.
- (39) FOUNDATION WALL AREA. See WALL AREA-FOUNDATION.
- (40) FOSSIL FUEL. An organic material, other than wood, used as fuel.
- (41) FUEL. A material which may be used to produce heat or generate power by combustion.
- (42) FURNACE. Any gas-fired, oil-fired, or electric, forced-air, self-contained appliance designed to provide a positive heating supply.
- (43) GENERAL LIGHTING. Lighting designed to provide a substantially uniform level of illumination throughout an area. General lighting shall not include lighting designed to provide a dissimilar level of illumination to serve a specialized application or feature within such area.
- (44) GENERALLY ACCEPTED ENGINEERING STANDARDS. A specification, rule, guide, or procedure in the field of engineering, or related thereto, recognized and accepted as authoritative.
- (45) GENERAL SERVICE LAMPS. A class of incandescent lamps which provide light in virtually all directions. General service lamps are typically characterized by bulb shape such as A, standard; S, straight side; F, flame; G, globe; PS, pear straight; and others.
- (46) GLAZING. Any translucent or transparent materials in exterior openings of buildings including, but not limited to windows, doors, skylights, patio doors, and glass block.
- (47) GLAZING AREA. Areas of glazing including frames and sash area as measured from the rough opening in the opaque wall or roof.
- (48) GROSS WALL AREA. See WALL AREA- GROSS.
- (49) HEAT. The form of energy that is transferred by virtue of a temperature difference or a change in state of a material.
- (50) HEAT PUMP. An air conditioner which is capable of providing heat by mechanical refrigeration, and which may or may not include a cooling capability.
- (51) HEATING SEASONAL PERFORMANCE FACTOR (HSPF). The total heating output of a central air conditioning heat pump, in British thermal units, during its normal usage period for heating, divided by the total electric energy input in watt-hours during the same

period.

- (52) HIGH INTENSITY DISCHARGE (HID) LAMP. An electric discharge lamp in which light is produced when an electric arc is discharged through a vaporized metal such as mercury or sodium. Some HID lamps may also have a phosphor coating which contributes to the light produced or enhances the light color.
- (53) HUMIDISTAT. A device which measures changes in humidity and controls a device or devices for maintaining a desired humidity.
- (54) HVAC SYSTEM. Heating, ventilating, or air conditioning system that provides comfort conditioning within or associated with a building.
- (55) ILLUMINATION. The action of supplying an area or surface with light.
- (56) INCANDESCENT LAMP. A lamp in which light is produced by a filament heated to incandescence by an electric current.
- (57) INDUSTRIAL PROCESS EQUIPMENT. Any equipment in a building that has a function other than comfort conditioning, service water heating, lighting, or other occupant convenience.
- (58) INFILTRATION. The inward air leakage through cracks and interstices in any building element and around windows and doors of a building.
- (59) INFILTRATION BARRIER. A continuous, air-resistant sheet of material which is not a vapor retarder and which serves primarily to control air infiltration through the building envelope.
- (60) INSULATION. Any material which serves primarily to resist the flow of heat through it.
- (61) LAMP EFFICACY. The quotient of the total lumens emitted from a lamp divided by the total lamp power input, expressed in lumens per watt.
- (62) LICENSED PROFESSIONAL. An architect or engineer licensed to practice in the State of New York.
- (63) LUMEN. The time rate of the flow of light to a unit surface all points of which are at unit-distance from a uniform point-source of one candela.
- (64) LUMINAIRE. A complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps, and to connect the lamps to the power supply.
- (65) MANUAL. Capable of being operated by personal intervention. (See AUTOMATIC.)
- (66) MUNICIPALITY. Any county, city, town, village, school district or district corporation.
- (67) NET WALL AREA. See WALL AREA- NET.
- (68) OUTDOOR AIR. Air taken from the outdoors and, therefore, not previously circulated through the building or its HVAC system.
- (69) PACKAGED TERMINAL AIR CONDITIONER (PTAC). An unencased air conditioner and separate wall sleeve designed as a unit for mounting through a wall for the purpose of delivering conditioned air to an enclosed space without the use of ducts.

- (70) PACKAGED TERMINAL HEAT PUMP (PTHP). A package terminal air conditioner which provides heating through a reverse cycle or heat pump mode.
- (71) PERM. Unit of measure of the rate of moisture travel through a substance, expressed in grains/ (hr. sq. ft. inches Hg).
- (72) POOL HEATER. An appliance designed for heating non-potable water contained at atmospheric pressure, including heating water in swimming pools, spas, hot tubs, and similar applications.
- (73) POSITIVE HEATING OR COOLING SUPPLY. Heating or cooling supplied to a space by mechanical systems.
- (74) POWER. In connection with machines, the time-rate of doing work. In connection with the transmission of energy of all types, the rate at which energy is transmitted. Power is customarily measured in units of British thermal units per hour (Btu/hr) or watts(w).
- (75) POWER FACTOR. The ratio of true power (watts) to apparent power(volt-amperes).
- (76) RECOOL. The sensible cooling of air that has previously been heated by an HVAC system.
- (77) REFLECTOR LAMPS. A class of incandescent lamps which have an internal reflector to direct the light. Reflector lamps are typically characterized by reflective characteristics such as: R, reflector; ER, ellipsoidal reflector; PAR, parabolic aluminized reflector; MR, mirrorized reflector; and others.
- (78) REHEAT. The heating of air that has been previously cooled either by mechanical refrigeration or economizer cooling systems.
- (79) RESET. Adjustment of the set point of a control instrument to a higher or lower value to conserve energy.
- (80) RESIDENTIAL BUILDINGS. Buildings whose primary function is to serve as a dwelling place for individuals or families, or multiple housing for travelers, students, or the infirm. Meals and housekeeping services may or may not be provided. Buildings in this category shall include but not be limited to one-and two-family dwellings, multiple dwellings, hotels, motels, dormitories, nursing homes, and residential care facilities.
- (81) RESISTANCE THERMAL (R). The measure of the resistance of a material to the passage of heat, expressed in units of °F x sq ft/(Btu/hr).
- (82) ROOF/CEILING. All components of the building envelope that form a surface which is less than 60° or more than 120° from horizontal.
- (83) ROOM AIR CONDITIONER. An encased air conditioner designed for mounting in a window or through the wall for the purpose of providing free delivery of conditioned air to an enclosed space without the use of ducts.
- (84) ROOM CAVITY RATIO (RCR). A factor that characterizes room configuration and is based upon room dimensions.
- (85) SEASONAL ENERGY EFFICIENCY RATIO (SEER). The ratio of the total cooling in Btu/hr during a normal annual usage period to the total electric input in watt-hours to the air conditioner or heat pump during the same period.

- (86) SERVICE WATER HEATING. The supply of hot water for domestic or sanitary purposes other than space heating.
- (87) SHADING COEFFICIENT (SC). The ratio of the solar heat gain through glazing to the solar gain through an unshaded 1/8" thick clear double strength sheet of glass under the following conditions:
- |                      |                      |
|----------------------|----------------------|
| ambient temperature  | = 89°F               |
| indoor temperature   | = 75°F               |
| outdoor air velocity | = 7.5 mph            |
| solar intensity      | = 248 Btu/(hr-sq ft) |
| incidence            | = normal             |
- (88) SMOKE SPOT NUMBER. The number corresponding to the spot on the Bacharach smoke scale, or other equivalent smoke scale, most closely matching the shade of a test spot, which is obtained by pulling a fixed volume of flue gas through a fixed area of standard filter paper.
- (89) STANDBY LOSS. The heat loss occurring while maintaining final water temperature over periods when no hot water is being drawn from the water tank, expressed as the heat lost per square foot of surface area of the jacket. With respect to oil- and gas-fired water heaters, the heat loss shall include loss due to the passage of air over heat transfer surfaces.
- (90) STORY. That portion of a building that is between one floor level and the next higher floor level or roof. A basement/cellar shall not be a story.
- (91) SUBSTANTIAL RENOVATION. The alteration of any existing building in which more than 50 percent of any building system is replaced.
- (92) SYSTEM OR SUBSYSTEM. A building assembly or equipment which serves a specific function, including, but not limited to, an exterior wall, a roof/ceiling, a floor or a slab, lighting, piping, ductwork, and equipment.
- (93) TERMINAL UNIT. The means by which comfort conditioning is finally delivered to a space; for example: registers and diffusers.
- (94) TESTING STANDARD. Refers to the testing standard referenced in Part 7816 of this Title to be used for determining compliance with this Code.
- (95) THERMAL EFFICIENCY. The ratio of the heat absorbed by the water to the heat input delivered to the heating unit during the period that the water temperature is raised from the initial temperature to the final water temperature.
- (96) THERMAL RATING. The relative measure of thermal performance of a building or building envelope feature as determined using Part 7815 of this Title.
- (97) THERMOSTAT. An instrument which measures change in temperature and which controls a device or devices for maintaining a desired temperature.
- (98) TOTAL LUMINAIRE EFFICIENCY (TLE). The ratio of the lumen output of a luminaire to the lumens produced by the lamp or lamps used with the luminaire.

- (99)  $U$ . The time rate of steady-state heat flow, through combinations of different materials along the heat flow path including: single materials, cavity air spaces, and surface air films on both sides of a building element. It is expressed in units of  $\text{Btu}/(\text{hr} \cdot \text{sq ft} \cdot ^\circ\text{F})$ .
- (100)  $U_o$ . The overall, area-weighted average, time rate of steady-state heat flow through a gross area of the building envelope. The  $U_o$  value is the area-weighted average of the  $U$ -values along one or more parallel heat flow paths through building envelope elements expressed in  $\text{Btu}/(\text{hr} \cdot \text{sq ft} \cdot ^\circ\text{F})$ .
- (101)  $U_g$ . The area-weighted average time rate of steady-state heat flow through glazing areas expressed in  $\text{Btu}/(\text{hr} \cdot \text{sq ft} \cdot ^\circ\text{F})$ .
- (102)  $U_w$ . The time rate of steady-state heat flow through the elements of the net wall area, expressed in  $\text{Btu}/(\text{hr} \cdot \text{sq ft} \cdot ^\circ\text{F})$ . The  $U_w$  shall be the area-weighted average  $U$ -value for the composite construction of the net wall area, including structural members such as studs.
- (103) UNCONDITIONED SPACE. An enclosed space which is not a conditioned space.
- (104) VAPOR RETARDER. A sheet of material which serves primarily to retard or prevent the transfer of moisture into a construction assembly and which has a permeance of one perm or less.
- (105) VESTIBULE. A space at the entrance to a building with doors on opposite or adjacent walls forming an air lock.
- (106) WALL. All components of the building envelope that form a surface which is between  $60^\circ$  and  $120^\circ$  degrees from horizontal.
- (107) WALL AREA-FOUNDATION. The area of walls that are located below the building's first floor above grade and, on average, are not exposed more than four feet above grade.
- (108) WALL AREA-GROSS. The overall exterior wall area (including foundation walls above grade, the space between floor spandrels, and peripheral edges of floors), glazing areas, and door areas, where such surfaces are part of the building envelope.
- (109) WALL AREA-NET. The gross wall area excluding foundation wall areas, glazing areas, and door areas.
- (110) WATER GAUGE. Height in inches of a column of water supported by a given static air pressure differential.
- (111) WATER HEATER. An automatically controlled vessel designed primarily for heating water or heating and storing water to provide hot water service for domestic or sanitary purposes.
- (112) ZONE. A space or group of spaces within a building with sufficiently similar comfort conditioning requirements so that comfort conditions can be maintained throughout by a single controlling device.

## Part 2

### 7811 Design Conditions

#### 7811.1 Scope

This Part establishes minimum conditions for the design of buildings.

#### 7811.2 Outdoor Design Conditions

- (a) The outdoor design temperatures for winter and summer shall be selected from Table 2-1 based on the location of the proposed construction.
- (b) The heating degree days noted in Table 2-1 shall be used to establish the required thermal performance values applicable to the components of the building envelope.

#### 7811.3 Indoor Design Conditions

- (a) The indoor design temperature shall be a maximum of 72°F for heating and minimum of 78°F for cooling.
- (b) Special applications.
  - (1) Those buildings, or portions thereof, which require different temperatures, such as, but not limited to, hospitals, laboratories, museums, art galleries, supermarkets, thermally sensitive equipment rooms, computer rooms, horticultural greenhouses, and facilities for the elderly, may require the use of alternative indoor design conditions. Any such use of alternative indoor design conditions shall be documented by a licensed professional.
  - (2) When indoor design temperatures for special applications vary more than 5°F from 72°F for cooling, the maximum  $U_o$  may be adjusted from that specified in Table 4-1 in accordance with the following equation:

$$U_o \text{ (adjusted)} = \frac{U_o \text{ (Table 4-1)} \times \Delta t \text{ (Table 2-1)}}{\Delta t \text{ (design)}}$$

$\Delta t$  = temperature difference between exterior and interior design condition in °F.

#### 7811.4 Ventilation

For mechanical supply and exhaust ventilation systems, the outdoor air quantities to be used as the basis for calculation the heating and cooling design loads shall be those requirements of the applicable health or life safety code or, in the absence of such requirements, shall be based on generally accepted engineering standards.

<b>Table 2-1</b>	<b>Climatic Conditions - New York State</b>			
<b>County</b>	<b>Winter Design Dry-Bulb Temp.</b>	<b>Summer Design Dry-Bulb Temp.</b>	<b>Coincident Wet-Bulb Temp.<sup>1/</sup></b>	<b>Degree Days</b>
Albany	-2	88	72	7000
Allegany	-2	84	71	7000
Bronx	15	89	73	5000
Broome	1	83	69	7000
Cattaraugus	-5	84	71	7000
Cayuga	2	87	71	7000
Chautauqua	3	86	72	7000
Chemung	1	86	71	7000
Chenango	-5	87	70	8000
Clinton	-9	86	69	8000
Columbia	1	85	74	7000
Cortland	0	85	71	8000
Delaware	-4	83	69	7000
Dutchess	1	90	74	7000
Erie	6	85	70	7000
Essex	-12	86	69	9000
Franklin: Adirondack Park	-13	81	69	9000
Outside Park	-10	84	70	8000
Fulton	-2	86	71	8000
Genesee	5	87	71	7000
Greene	-2	86	72	7000
Hamilton	-12	81	69	9000
Herkimer: Adirondack Park	-16	80	69	9000
Outside Park	-3	84	70	8000
Jefferson	-6	83	71	7000
Kings	15	89	73	5000
Lewis	-7	84	71	8000
Livingston	1	89	71	7000
Madison	-5	85	71	8000
Monroe	4	88	71	7000
Montgomery	-2	85	72	7000
Nassau	15	88	71	5000
New York	15	89	73	5000

Table 2-1 (cont)	Climatic Conditions - New York State			
County	Winter Design Dry-Bulb Temp.	Summer Design Dry-Bulb Temp.	Coincident Wet-Bulb Temp. <sup>1/</sup>	Degree Days
Niagara	5	86	72	7000
Oneida	-6	85	70	8000
Onondaga	2	87	71	7000
Ontario	2	87	71	7000
Orange	4	90	72	6000
Orleans	4	86	71	7000
Oswego	7	83	71	7000
Otsego	-4	84	69	8000
Putnam	4	87	74	6000
Queens	14	88	72	5000
Rensselaer	-3	86	72	7000
Richmond	14	89	73	5000
Rockland	8	90	72	6000
St. Lawrence: Adirondack Park	-13	81	71	9000
Outside Park	-8	84	71	8000
Saratoga	-5	86	72	7000
Schenectady	1	87	72	7000
Schoharie	-4	83	69	7000
Schuyler	0	85	71	7000
Seneca	2	87	71	7000
Steuben	0	85	70	7000
Suffolk	10	87	71	6000
Sullivan	0	83	72	7000
Tioga	-3	86	69	7000
Thompkins	0	85	71	7000
Ulster	2	88	72	7000
Warren	-5	85	71	8000
Washington	-8	89	71	8000
Wayne	4	87	71	7000
Westchester	11	89	74	6000
Wyoming	2	87	71	7000
Yates	5	87	71	6000

1/ Wet bulb temperatures may be increased by no more than 3 degrees than those wet-bulb temperatures listed where a licensed professional documents that a higher wet-bulb temperature is necessary for design of a building in which building loads are driven by ventilation.

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## Part 3

### 7812 Alternate Building Design by Annual Energy Analysis

#### 7812.1 Scope

This Part establishes criteria for the design of buildings in terms of the building's annual energy usage.

#### 7812.2 Analysis Criteria

- (a) Compliance with this Part will require an analysis of the annual energy usage of the proposed building design and a comparison of such usage with the annual energy usage of a standard building design.
- (b) The proposed building design will be deemed to meet the requirements of this Code if the annual energy usage of the proposed building design is not greater than the annual energy usage of a standard building design.
  - (1) For buildings otherwise subject to regulation by Part 7813 of this Title, the standard design shall be based on the criteria specified in Part 7813.
  - (2) For all other buildings, the standard design shall be based on the criteria specified in Part 7815 of this Title.
- (c) The standard building design shall be substantially identical to the proposed building design in the following respects:
  - (1) Function and design requirements;
  - (2) Size, shape, geometry and orientation;
  - (3) Operating schedule, temperature, humidity, ventilation and footcandles;
  - (4) Internal heat gains from occupants and equipment;
  - (5) Energy source for each energy end-use; and
  - (6) Equipment and system type.

#### 7812.3 Analysis Procedure

- (a) The energy usage of the standard building design and the proposed building design shall be determined through use of identical energy analysis procedures.
  - (1) This energy usage shall be expressed as total Btu usage per year per square foot of conditioned floor area for both the proposed building design and the standard building design.
  - (2) The energy usage from various energy sources shall be converted to Btu per year per square foot of conditioned floor area for purposes of comparing the annual energy usage. Electric energy usage shall be converted at the rate of 10,000 Btu/kwh for purposes of this analysis only.

- (b) The analysis procedure shall account for the operation of the building and its systems through a full-year operating period.
- (c) The analysis procedure shall be based upon generally accepted engineering practice.
- (d) The analysis of the annual energy usage of the standard building design and the proposed building design shall be based on the same outdoor weather conditions including temperatures, solar radiation, wind, and humidity of typical days in the year representing seasonal variation.

#### **7812.4 Documentation**

The analysis of the annual energy usage of the proposed building design and the standard building design shall be prepared by a licensed professional. These analyses shall provide technical data on the proposed building design, the standard building design, and the data used to verify that the requirements of this Code are met.

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## Part 4

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### 7813 Building Design by Component Performance

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#### 7813.1 Scope

This Part establishes criteria for the design of HVAC, service water heating, electrical, and lighting systems and equipment for all buildings. This Part also establishes criteria for the design of building envelope systems of all buildings four stories or more in height and all buildings less than four stories in height in which dwelling units do not comprise the majority of conditioned floor area.

#### Building Envelope Systems

#### 7813.2 General Criteria

- (a) The thermal performance requirements (expressed as  $U_o$ ,  $R$ ,  $R_i$ , or  $SC_o$ .) for each component of the building envelope are specified in Tables 4-1 and 4-2.
- (b) If any building envelope component does not conform to the applicable thermal performance requirement specified in Table 4-1, the thermal performance of the other building envelope components may be adjusted to compensate for the nonconforming envelope component; provided, however, that the total heat loss through the building envelope is determined to be equal to or less than the heat loss which would otherwise result from conformance to the requirements of Table 4-1. For purposes of this determination, a heat loss for both the conforming envelope and the nonconforming envelope shall be established in accordance with paragraphs (1) and (2) of this subdivision.
  - (1) The heat loss for the conforming envelope shall be that heat loss which would result from the design of a building in accordance with the applicable thermal performance requirements specified in Table 4-1 for each building envelope component and the actual areas of these components.
  - (2) The heat loss for the nonconforming envelope shall be that heat loss which would result from the design of a building in accordance with the nonconforming, actual thermal performance values and actual areas of these components.

#### 7813.3 Thermal Performance of Envelope Systems

- (a) Buildings regulated by this Part, shall be designed in accordance with the thermal performance values given in Table 4-1.
- (b) Floors over unconditioned spaces shall be designed in accordance with the thermal performance values given in Table 4-1. Alternatively, foundation walls above and below grade shall be designed in accordance with the thermal performance values given in Table 4-1; provided, however, that:
  - (1) When comfort conditioning is provided to the basement/cellar, the foundation walls above and below grade shall be insulated; and
  - (2) When a space below a floor is exposed to ambient conditions, the floor over that space shall be insulated.

- (c) All building envelope elements that contain materials which are capable of absorbing or taking up and holding moisture shall be protected by a vapor retarder located on the winter warm side of the insulation.
- (d) Insulation shall be installed in a manner that provides continuity of insulation at plate lines, sill lines, band joists, and corners.

<b>Table 4-1</b> <sup>1/</sup>	<b>Thermal Performance Values for Building Envelope Systems Regulated by this Part</b>
<b>Envelope System</b>	<b>Thermal Performance</b>
Walls <sup>2/</sup>	Maximum U <sub>o</sub> 0.20
Roofs and Floors <sup>3/</sup>	Maximum U <sub>o</sub> 0.05
Foundation Walls <sup>4/</sup> Below Grade	Minimum R 5.00
Slab Edge <sup>5/</sup>	Minimum R <sub>f</sub> 5.00
<p>1/ Equation 4-1 shall be used to determine acceptable combinations of materials to meet these requirements provided, however, that whenever generally accepted engineering practice is used to calculate the effects of all thermal bridges in the opaque portion of the exterior wall, a U<sub>o</sub> of 0.26 may be used.</p> <p>2/ The U<sub>o</sub> value shall include foundation walls above grade.</p> <p>3/ For thermal transmittance purposes, the thermal performance of a roof or floor shall not include the thermal performance of a supply or return air plenum.</p> <p>4/ The R-value of foundation wall materials shall be required to extend to a minimum of 24" below grade.</p> <p>5/ Slab edge insulation shall extend from the top of the slab to either: (a) a minimum depth of 24" below grade or below the top of the slab, whichever is greater; or (b) from the top of the slab to the bottom of the slab, and then a horizontal distance of 24" beneath the slab.</p>	

<b>Equation 4-1</b>	$U_o = \frac{U_w A_w + U_g A_g + U_d A_d + \dots}{A_o}$	
U <sub>o</sub> = average or combined transmittance of the exterior wall or floor or roof/ceiling area in Btu/(hr · sq ft · °F)	A <sub>w</sub> =	area of opaque wall or floor or roof/ceiling (A <sub>w</sub> or A <sub>f</sub> or A <sub>r</sub> ).
A <sub>o</sub> = area of exterior wall or floor or roof/ceiling.	A <sub>g</sub> =	area of glazing
U <sub>d</sub> = thermal transmittance of the door or similar opening.	U <sub>g</sub> =	thermal transmittance of the glazing (window or skylight) area.
U <sub>w</sub> = thermal transmittance of the opaque portion of the exterior wall or floor or roof/ceiling area (U <sub>w</sub> or U <sub>f</sub> or U <sub>r</sub> ). The U <sub>w</sub> shall be the average value for the composite construction of each assembly including structural members such as studs and joints.		
A <sub>d</sub> = area of door (shall be the finished opening).		
Note: Where more than one type of wall, window, door, roof/ceiling or skylight is used, the U and A terms for those items shall be expanded into subelements as: U <sub>w1</sub> A <sub>w1</sub> + U <sub>w2</sub> A <sub>w2</sub> + U <sub>w3</sub> A <sub>w3</sub> + etc...		

- (e) Glazing on roofs and east, west and south facing walls shall have overall shading coefficients (SC<sub>o</sub>) not exceeding those specified in Table 4-2. East, west and south facing walls are walls oriented more than 45° away from true north.

Table 4-2	Overall Shading Coefficients for Buildings Regulated by this Part	
% Glazing <sup>1/</sup>	SC <sub>o</sub> <sup>2/</sup> Walls East, West and South	SC <sub>o</sub> <sup>2/</sup> Roofs
10 - 20	0.80	0.70
21 - 30	0.65	0.50
31 - 40	0.50	0.40
> 40	0.40	0.30

1/ % Glazing = (glazing area of east, west and south walls + glazing of roof) / gross wall area of all east, west and south walls.

2/ The overall shading coefficient (SC<sub>o</sub>) is the area weighted average shading coefficient of all glazing on either east, west and south walls or roofs.

#### 7813.4 Air Infiltration of Envelope Systems

- (a) Manufactured doors and windows shall have air infiltration rates not exceeding those shown in Table 4-3. Site constructed doors and windows shall be sealed in accordance with (b) below.
- (b) All joints and openings in building envelope systems, including those around windows and door frames, between walls and roof/ceilings, between walls and floors or foundations, between wall panels, at utility service penetrations, and between dissimilar materials shall be caulked, gasketed, weatherstripped, or otherwise sealed.
- (c) An air infiltration barrier shall be installed wherever a ventilated siding material is installed or the siding installation technique necessitates a loose-fitting application.
- (d) Main entrance doors that open into a common lobby or hallway shall be of vestibule or revolving-door type. Vestibule doors shall be self-closing.

Table 4-3	Infiltration Loss for Windows and Doors <sup>1/</sup>	
Windows <sup>2/</sup>	Residential Doors <sup>3/</sup>	Nonresidential Doors <sup>3/</sup>
0.37 cfm	0.5 cfm	1.25 cfm

1/ When tested at a static pressure differential of 1.57 lb/sq ft which is equivalent to the impacy pressure of a 25-mph wind.

2/ cfm per linear foot of sash crack.

3/ cfm per square foot of door area.

## 7813.5 Fireplaces

- (a) All fireplace units shall have infiltration losses with the damper in the closed position not to exceed 20 cfm at 0.3 inches water gauge. If the damper alone does not meet this requirement, tight fitting noncombustible fireplace doors shall be used.
- (b) All fireplace units shall be provided with a source of combustion air, ducted from the outdoors, of sufficient quantity to support combustion. This source shall be equipped with a damper capable of being fully closed.
- (c) No device installed in a fireplace that uses a gaseous fuel for its operation shall be equipped with a continuously operated standing pilot light.

## Building HVAC Systems and Equipment

### 7813.11 General

Sections 7813.12-7813.21 of this Part prescribe requirements for heating and cooling system design, system and component performance, system control, insulation of distribution systems, and duct construction.

### 7813.12 Design of HVAC Systems

- (a) The design conditions specified in Part 7811 of this Title shall apply for all calculations.
- (b) Calculation procedures. For the purpose of sizing HVAC systems, heating and cooling design loads, including the impact of infiltration, shall be determined in accordance with generally accepted engineering standards.

### 7813.13 Control of HVAC Systems

- (a) Temperature Control.
  - (1) Residential buildings containing dwelling units: at least one thermostat capable of automatically adjusting the space temperature set point shall be provided for each separate dwelling unit. In addition, an accessible manual or automatic means shall be provided to restrict or shut off the heating and/or cooling to each terminal unit.
  - (2) All other buildings: at least one thermostat capable of automatically adjusting the space temperature set point shall be provided for each separate heating, ventilating, or cooling system. Where such systems serve more than one zone, a thermostat shall be provided for each separate zone.
- (b) Thermostat. Each thermostat shall have a minimum range of temperature settings from 45°F to 85°F, and shall be capable of operating the system heating and cooling in sequence. All thermostats shall be capable of providing a deadband of 5°F between full heating and cooling.
- (c) Humidistat. If an HVAC system is equipped with a humidistat, such humidistat shall be capable of being set to prevent moisture from being added to produce relative humidity in the space above 30 percent or moisture being removed to produce a relative humidity in the space below 60 percent.

### 7813.14 Reset of HVAC Systems

HVAC System reset shall be required for the following:

- (a) Reheat systems. Reheat systems (other than variable air volume systems) shall be provided with a control that will automatically reset the system cold air supply temperature to the highest temperature level that will satisfy the zone requiring the most cooling. Single zone reheat systems shall be controlled to sequence reheat and cooling.
- (b) Dual duct and multi-zone systems. Systems that provide temperature control for buildings with more than 20,000 square feet of conditioned space and that use energy to simultaneously heat or cool air streams which are subsequently mixed for temperature control shall be provided with a control that will automatically reset:
  - (1) The cold deck air supply temperature to the highest temperature that will satisfy the zone requiring the most cooling; and
  - (2) The hot deck air supply temperature to the lowest temperature that will satisfy the zone requiring the most heating.
- (c) Recooling systems. Recooling systems shall be provided with a control that will automatically reset the system hot air supply temperature to the lowest temperature that will satisfy the zone requiring the most heating.
- (d) Hydronic systems. Any hydronic HVAC system with a design capacity of 600,000 Btu/hr or greater shall include controls that automatically reset supply water temperatures by representative building loads or by outside air temperature provided, however, that any hydronic HVAC system with a design capacity of 300,000 Btu/hr or greater and which supplies heated water only shall be equipped with such reset controls.

### 7813.15 Economizer Cycle of HVAC Systems

- (a) Each air conditioner or air-handling unit shall be designed with an economizer cycle to automatically either:
  - (1) Utilize outdoor air for up to and including 100 percent of the fan system capacity for cooling with outdoor air whenever energy would otherwise be required for cooling. The economizer cycle shall be activated automatically whenever cooling is required and the total latent and sensible heat content of the outdoor air is lower than that of the indoor air; or
  - (2) Provide 100 percent of the expected system cooling load by means of a circulating liquid which transfers space heat directly or indirectly to a heat rejection device, such as a cooling tower, without the use of a refrigeration system, at outside air temperatures of 50°F dry-bulb and 45°F wet-bulb and below.
- (b) An economizer cycle shall not, however, be required when any of the following conditions are present:
  - (1) An individual air conditioner or air-handling unit has a cooling capacity of less than 90,000 Btu/hr or an air volume of less than 3,000 cfm, provided, however, that the total combined capacity of individual air conditioners and air-handling units for a building shall not exceed 600,000 Btu/hr;
  - (2) The quality of the outdoor air is so poor as to require extensive treatment of the air;

- (3) The need for humidification or dehumidification would require the use of more energy than is conserved by the outdoor air cooling;
- (4) The use of outdoor air cooling would affect the operation of other systems by increasing the overall energy consumption of the building;
- (5) The use of outdoor air cooling would affect the operation of systems using internal to external zone heat recovery, or other type of energy recovery systems; or
- (6) Individual air conditioners or air-handling units that serve dwelling units or other individual residential spaces.

### **7813.16 Ventilation Systems**

#### (a) Shutoff dampers.

- (1) Supply and exhaust air intakes and outlets with a capacity of less than 1000 cfm shall be equipped with tight shutoff dampers at the building envelope to minimize air leakage.
- (2) Supply and exhaust air intakes and outlets with a capacity of 1000 cfm or greater shall be equipped with dampers which shall have a maximum leakage rate of 20 cfm per square foot of face area at a four inches water gauge differential static pressure.
- (3) Commercial kitchen range hoods, dust collectors, and laboratory fume hoods, where life safety codes do not permit a damper at the building envelope, are exempt from these requirements.

#### (b) Control.

- (1) Supply and exhaust ventilation systems which are designed for continuous operation shall be equipped with a control capable of providing automatic shutoff or volume reduction when the need for the full air quantity has been reduced.
- (2) Supply and exhaust ventilation systems which are not designed for continuous operation shall be equipped with an independent, accessible control for shutoff when ventilation is not required.

### **7813.17 HVAC Pumping Equipment**

Any pump larger than 25 horsepower shall be a variable speed pump capable of reducing flow to 50 percent of the design flow or less, except in systems in which a minimum flow greater than 50 percent of the design flow is required for the proper operation of equipment served by the system. This requirement shall not apply to pumps used exclusively for standby purposes.

### **7813.18 Insulation of Piping Systems**

- (a) All piping installed to service buildings and within buildings shall be insulated in accordance with Table 4-4.
- (b) Insulation thicknesses in Table 4-4 are based on insulation having an R-value in the range between R-4.0 and R-4.6 per inch. Minimum insulation thickness may be adjusted for materials that have an R-value outside this range as follows:

(1) Materials with R-value greater than 4.6,

$$\text{thickness} = \frac{4.6 \times \text{Table 4-4 thickness}}{\text{actual R-value}}$$

(2) Materials with R-value less than 4.0,

$$\text{thickness} = \frac{4.0 \times \text{Table 4-4 thickness}}{\text{actual R-value}}$$

<b>Table 4-4</b>		<b>Minimum Pipe Insulation<sup>1/</sup></b>					
System Types	Fluid Temp. Range	Runouts <sup>2/</sup>	Branches, Mains and Loops <sup>3/</sup>				
			Pipe Diameter (inches)				
	°F	≤ 1"	1 1/4"-2"	2 1/2"-4"	5"-6"	≥ 8"	Insulation Thickness (inches)
<b>Fluid Heating:</b>							
Steam, Steam Condensate, Hot Water	351-450	1 1/2	2 1/2	2 1/2	3	3 1/2	3 1/2
	251-350	1 1/2	2	2 1/2	2 1/2	3 1/2	3 1/2
	141-250	1	1 1/2	1 1/2	2	2	2 1/2
	105-140	1/2	3/4	1	1	1 1/2	1 1/2
<b>Fluid Cooling:<sup>4/</sup></b>							
Chilled Water, Brine, Refrigerant	40-55	1/2	1/2	1	1	1	1
	Below 40	1	1	1 1/2	1 1/2	1 1/2	1 1/2
<p>1/ Piping insulation shall not be required in the following cases:</p> <ul style="list-style-type: none"> <li>(a) piping installed within HVAC or service water heating equipment;</li> <li>(b) piping for fluids at temperatures between 55°F and 105°F;</li> <li>(c) piping installed within conditioned spaces in residential buildings containing one or two dwelling units.</li> <li>(d) piping sized 3/4" and less for service water distribution in residential buildings containing one or two dwelling units or in other residential buildings where each dwelling unit is served by a separate service water heater located within such dwelling unit.</li> </ul> <p>2/ Piping that is less than 12' long and connected directly to fixtures or terminal units.</p> <p>3/ Piping that is not a runout.</p> <p>4/ Does not apply to piping installed more than 2' below grade.</p>							

### 7813.19 Insulation of Duct Systems

All ducts or plenums designed to supply heated and/or cooled air shall be insulated as follows:

- (a) When the temperature difference between the air in the duct or plenum and the surrounding air is between 15°F and 52.5°F, the duct or plenum shall be insulated to provide a minimum R-value of 3.5, excluding air film resistances.
- (b) When the temperature difference between the air in the duct or plenum and the surrounding air exceeds 52.5°F, the following formula shall be used for determining the R-value, excluding film resistances:

$$R = \frac{\Delta t (\text{°F})(\text{sq ft})}{15 (\text{Btu/hr})}$$

Where:  $\Delta t$  = the design temperature differential between the air in the duct or plenum and the surrounding air in °F.

- (c) Duct or plenum insulation (except where used to prevent condensation) shall not be required, however, in any of the following cases:
  - (1) Where  $\Delta t$  is less than 15°F;
  - (2) When ducts are installed within conditioned spaces of residential buildings containing no more than two dwelling units; and
  - (3) Within HVAC equipment.

### 7813.20 Sealing of Duct Systems

All supply air ducts located outside of the zone being served shall be sealed with adhesives, sealants, gaskets, tape systems, or combinations thereof. This requirement shall apply as follows:

- (a) For duct systems with a static pressure of 2 inches water gauge or less, all transverse joints shall be sealed.
- (b) For duct systems with a static pressure of more than two inches water gauge but less than four inches water gauge, all transverse joints and longitudinal seams other than continuously welded or spiral lock seams shall be sealed.
- (c) For duct systems with a static pressure of four inches water gauge or more, all transverse joints, duct penetrations, and longitudinal seams other than welded or spiral lock seams shall be sealed.

### 7813.21 Performance of HVAC Equipment

- (a) General.
  - (1) This section specifies minimum performance requirements for equipment used for heating, ventilating, cooling, and air conditioning. Specified equipment efficiencies shall be based on standard rating conditions and shall be based on energy as delivered at the site.

- (2) When components, such as indoor or outdoor coils, from more than one manufacturer are used as parts of a system that provides comfort conditioning, component efficiencies shall be specified based on data provided by the component manufacturers. The combination of such components shall result in a system that is in compliance with the requirements of this section.
- (b) Gas- and oil-fired combustion heating equipment. Gas- and oil-fired combustion heating equipment shall have a minimum annual fuel utilization efficiency (AFUE) or combustion efficiency (CE) not less than the values shown in table 4-5.
- (c) Heat pumps. Heat pumps shall have a coefficient of performance (COP) or heating seasonal performance factor (HSPF) for heating and shall have a seasonal energy efficiency ratio (SEER) or energy efficiency ratio (EER) for cooling not less than the values shown in Table 4-6.
- (d) Packaged terminal air conditioners and heat pumps. Packaged terminal air conditioners shall have an energy efficiency ratio (EER) for cooling not less than the values shown in Table 4-7. Packaged terminal heat pumps shall have a coefficient of performance (COP) for heating and shall have an efficiency ratio (EER) for cooling not less than the values shown in Table 4-7.
- (e) Central air conditioners. Central air conditioners shall have an energy efficiency ratio (EER) or a seasonal energy efficiency ratio (SEER) for cooling not less than the values shown in Table 4-8.
- (f) Chillers. Electrically driven water chillers shall have an energy efficiency ratio (EER) for cooling not less than the values shown in Table 4-9.
- (g) Condensing units. Electrically driven condensing units 65,000 Btu/hr and over shall have an energy efficiency ratio (EER) for cooling not less than the values shown in Table 4-10.
- (h) Heat-operated cooling equipment. Heat-operated cooling equipment shall have a coefficient of performance (COP) for cooling not less than the values shown in Table 4-11. These requirements apply to, but are not limited to, absorption equipment, engine driven equipment, and turbine driven equipment.

<b>Table 4-5 Gas- and Oil-Fired Combustion Heating Equipment<sup>1/</sup> Minimum Performance</b>			
Category	Size	Minimum Performance	
US DOE Covered (Single Phase)			
Gas-Fired Furnace	Less than 225,000 Btu/hr	70% AFUE	(78% AFUE)
Oil-Fired Furnace	Less than 225,000 Btu/hr	75% AFUE	(78% AFUE)
Gas-Fired Boiler	Less than 300,000 Btu/hr	70% AFUE	(80% AFUE)
Gas-Fired, Steam Boiler	Less than 300,000 Btu/hr	70% AFUE	(75% AFUE)
Oil-Fired Boiler	Less than 300,000 Btu/hr	75% AFUE	(80% AFUE)
Non-US DOE Covered			
Gas-Fired Furnace	All	75% CE	(80% CE)
Oil-Fired Furnace	All	78% CE	(81% CE)
Gas-Fired Boiler	All	75% CE	(80% CE)
Oil-Fired Boiler	All	78% CE	(83% CE)
1/ Performance requirements in parenthesis applicable to equipment manufactured after January 1, 1992.			

<b>Table 4-6 Heat Pumps<sup>1/</sup> Minimum Performance</b>				
Category	Air-Source <sup>2/</sup>		Water <sup>3/</sup> Source	Groundwater <sup>4/</sup> Source
	Single Phase	Three Phase		
<b>&lt; 65,000 Btu/hr</b>				
Heating	2.6 COP	2.6 COP	3.3 COP	2.8 COP
	(6.8 HSPF <sup>5/</sup> )	(6.8 HSPF <sup>5/</sup> )	(3.8 COP)	(3.0 COP)
Cooling	8.5 SEER	8.9 SEER	9.0 EER	10.0 EER
	(10.0 SEER <sup>6/</sup> )	(10.0 SEER)	(9.3 EER)	(11.0 EER)
<b>≥ 65,000 Btu/hr, ≤ 135,000 Btu/hr</b>				
Heating	2.8 COP	2.8 COP	3.0 COP	3.0 COP
	(3.0 COP)	(3.0 COP)	(3.8 COP)	(3.0 COP)
Cooling	8.3 EER	8.3 EER	9.5 EER	10.0 EER
	(8.9 EER)	(8.9 EER)	(10.5 EER)	(11.0 EER)
<b>&gt; 135,000 Btu/hr</b>				
Heating	2.8 COP	2.8 COP	3.0 COP	3.0 COP
	(2.9 COP)	(2.9 COP)	(3.0 COP)	(3.0 COP)
Cooling	8.2 EER	8.2 EER	7.5 EER	7.5 EER
	(8.5 EER)	(8.5 EER)	(7.5 EER)	(7.5 EER)
<p>1/ Except as provided in footnotes 5 and 6 below, performance requirements in parenthesis applicable to equipment manufactured after Jan. 1, 1992.</p> <p>2/ COP @ 47°db</p> <p>3/ COP @ 70°ent</p> <p>4/ COP @ 50°ent</p> <p>5/ Applicable to split systems manufactured after January 1, 1992; 6.6 HSPF applicable to single package systems manufactured after January 1, 1993.</p> <p>6/ Applicable to split systems manufactured after January 1, 1992; 9.7 SEER applicable to single package systems manufactured after January 1, 1993.</p>				

<b>Table 4-7 Packaged Terminal Air Conditioners and Heat Pumps<sup>1/</sup> Minimum Performance</b>		
Size	Heating <sup>2/</sup>	Cooling
< 7,500 Btu/hr	2.6 COP (2.7 COP)	8.7 EER (8.9 EER)
≥ 7,500 Btu/hr, < 10,000 Btu/hr	2.6 COP (2.7 COP)	8.3 EER (8.6 EER)
≥ 10,000 Btu/hr, < 13,000 Btu/hr	2.6 COP (2.7 COP)	7.8 EER (8.1 EER)
≥ 13,000 Btu/hr	2.6 COP (2.7 COP)	7.3 EER (7.7 EER)
<p>1/ Performance requirements in parenthesis applicable to equipment manufactured after January 1, 1992.</p> <p>2/ COP @ 47°db</p>		

<b>Table 4-8</b>		<b>Central Air Conditioners<sup>1/</sup> Minimum Performance</b>		
Category	Under 65,000 Btu/hr		65,000 Btu/hr to 135,000 Btu/hr	Greater than 135,000 Btu/hr
	Single Phase	Three Phase		
Air Cooled	9.5 SEER	8.9 SEER	9.3 EER	8.2 EER
	(10.0 SEER <sup>2/</sup> )	(10.0 SEER)	(8.9 EER)	(8.5 EER)
Water or Evap. Cooled	9.0 EER	9.0 EER	9.5 EER	9.4 EER
	(9.3 EER)	(9.3 EER)	(10.5 EER)	(9.6 EER)

1/ Except as provided in footnote 2, performance requirements in parenthesis applicable to equipment manufactured after January 1, 1992.

2/ Applicable to split systems manufactured after January 1, 1992; 9.7 SEER applicable to single package systems manufactured after January 1, 1992.

<b>Table 4-9 Chillers<sup>1/</sup> Minimum Performance</b>		
Category	Air	Water/Evaporative
<b>With Condenser</b>		
≥ 300 tons	8.2 EER (8.5 EER)	15.7 EER (17.7 EER)
< 300 tons and ≥ 150 tons	8.2 EER (8.5 EER)	12.6 EER (14.3 EER)
< 150 tons	8.9 EER (9.2 EER)	12.6 EER (12.9 EER)
<b>Without Condenser</b>		
all sizes	10.2 EER (10.6 EER)	12.0 EER (12.0 EER)

1/ Performance requirements in parenthesis applicable to equipment manufactured after January 1, 1992.

<b>Table 4-10 Condensing Units 65,000 Btu/hr and Over<sup>1/</sup> Minimum Performance</b>	
Category	Minimum Performance
Air	9.7 EER (9.9 EER)
Water/Evaporate	12.7 EER (12.9 EER)

1/ Performance requirements in parenthesis applicable to equipment manufactured after January 1, 1992.

<b>Table 4-11 Heat Operated Cooling Equipment Minimum Performance</b>	
Heat Source	
Direct Fired (Gas, Oil)	Indirect Fired (Steam, Hot Water)
0.48 COP	0.68 COP

## Building Service Water Heating Systems and Equipment

### 7813.31 General

Sections 7813.32-7813.34 provide criteria for the design and selection of service water heating equipment.

### 7813.32 Service Water Heating Equipment

- (a) Water heaters including pool heaters, shall comply with the performance requirements specified in Table 4-12.
- (b) Combination space and service water heating boilers may only be used in conjunction with an unfired hot water storage tank, and only when the following conditions are met:
- (1) The boiler must meet the minimum performance requirements specified in Table 4-5, and
  - (2) The unfired hot water storage tank must be insulated to provide an R-value of no less than R-6.

Category	Electric	Gas-Fired	Oil-Fired
USDOE Covered	$EF^{2/} \geq 0.93 - 0.00132V^{3/}$	$EF \geq 0.62 - 0.0019V$	$EF \geq 0.59 - 0.0019V$
All Other Storage	$SL^{4/} \leq 4.0$ w/sf of nsf <sup>5/</sup> ( $SL \leq 3.0$ w/sf of nsf)	$TE^{6/} \geq 76\%$ : $SL \leq 2.3 + 67/V$ ( $TE \geq 77\%$ : $SL \leq 1.3 + 38/V$ )	$CE^{7/} \geq 80\%$ : $SL \leq 2.3 + 67/V$ ( $CE^{7/} \geq 83\%$ : $SL \leq 1.3 + 38/V$ )
Instantaneous	- -	$TE \geq 75\%$ ( $TE \geq 80\%$ )	$CE \geq 80\%$ ( $CE \geq 83\%$ )
Pool Heaters	$TE \geq 78\%$	$TE \geq 78\%$	$TE \geq 78\%$

1/ Performance requirements in parenthesis applicable to equipment manufactured after January 1, 1992.

2/ EF = Energy factor, overall heating efficiency

3/ V = Storage volume in gallons

4/ SL = Standby loss based on 80°F Δt or % per hour based on 90°F Δt

5/ nsf = net square feet of tank area of water heater = 2(mean cross sectional area) + (length of mean cross section x mean perimeter)

6/ TE = Thermal efficiency with 70°F Δt

7/ CE = Combustion efficiency

### 7813.33 Insulation of Storage Tanks and Piping Systems

- (a) Unfired hot-water storage tanks shall be insulated to provide an R-value of no less than R-6.
- (b) Service hot water supply and recirculation piping shall be insulated in accordance with the requirements specified in Table 4-4 (see section 7813.18 (a) of this Part).

### **7813.34 Control of Service Water Heating Systems**

- (a) Service water heating systems shall be equipped with automatic temperature controls, capable of adjustment from the lowest to the highest acceptable temperature settings for the intended use.
- (b) Circulating hot water systems installed in nonresidential buildings shall be equipped with a control that is capable of automatically turning off circulating pumps when hot water is not required.
- (c) Pool heaters that use a gaseous fuel other than propane shall not be equipped with a continuously operated standing pilot light.
- (d) Shutdown
  - (1) A separate switch shall be provided to permit turning off the energy supplied to electric water heaters.
  - (2) A separate valve shall be provided to permit turning off the energy supplied to the main burner or burners of gas- and oil-fired water heaters.
  - (3) All pool heaters shall be equipped with an accessible on-off switch to allow shutting off the operation of the water heating system without adjusting the thermostat setting.

## **Building Electrical and Lighting Systems and Equipment**

### **7813.51 General**

Sections 7813.52-7813.54 provide criteria for the design and selection of electrical and lighting equipment and systems.

### **7813.52 Electrical Equipment and Systems**

- (a) Electric motors. All permanently-wired AC polyphase induction motors that serve the building shall meet the requirements of Table 4-13. These requirements only apply to the following:
  - (1) Motors with a nameplate-rated horsepower (hp) of 1 hp or larger;
  - (2) Motors that are designed for continuous operation;
  - (3) Motors designed to operate at a full-load rated speed of 1200, 1800, or 3600 rpm;
  - (4) Motors with an open, drip proof, or totally enclosed fan-cooled enclosure; and
  - (5) Motors designed to operated at rated starting torque and starting current.
- (b) Electrical system. In all residential buildings, each dwelling unit shall be provided with a separate electric meter.

HP	Poles RPM	Open Motors			Closed Motors		
		6 1200	4 1800	2 3600	6 1200	4 1800	2 3600
1.0		77.0 (80.0)	82.5 (82.5)	--	75.5 (81.5)	80.0 (84.0)	--
1.5		82.5 (84.0)	82.5 (84.0)	80.0 (82.5)	82.5 (85.5)	81.5 (85.0)	78.5 (84.0)
2.0		84.0 (86.5)	82.5 (84.0)	82.5 (84.0)	82.5 (86.5)	82.5 (84.0)	81.5 (85.5)
3.0		85.5 (86.5)	86.5 (86.5)	82.5 (84.0)	84.0 (88.5)	84.0 (88.5)	82.5 (86.5)
5.0		86.5 (88.5)	86.5 (87.5)	85.5 (85.5)	85.5 (88.5)	85.5 (88.5)	85.5 (87.5)
7.5		88.5 (89.5)	88.5 (88.5)	85.5 (87.5)	87.5 (89.5)	87.5 (91.0)	85.5 (88.5)
10		90.2 (90.2)	88.5 (89.5)	87.5 (88.5)	87.5 (89.5)	87.5 (91.0)	87.5 (89.5)
15		89.5 (91.0)	90.2 (90.2)	89.5 (89.5)	89.5 (90.2)	88.5 (91.0)	87.5 (89.5)
20		90.2 (90.2)	91.0 (91.0)	90.2 (90.2)	89.5 (91.0)	90.2 (91.7)	88.5 (90.2)
25		91.0 (91.7)	91.7 (92.4)	91.0 (91.0)	90.2 (91.7)	91.0 (92.4)	89.5 (90.2)
30		91.7 (92.4)	91.7 (93.0)	91.0 (92.4)	91.0 (92.4)	91.0 (93.6)	89.5 (91.0)
40		91.7 (93.0)	92.4 (93.0)	91.7 (92.4)	91.7 (93.0)	91.7 (93.0)	90.2 (91.0)
50		91.7 (92.4)	92.4 (94.1)	91.7 (92.4)	91.7 (93.6)	92.4 (93.6)	90.2 (92.4)
60		92.4 (93.0)	93.0 (93.6)	93.0 (93.0)	91.7 (93.6)	93.0 (94.1)	91.7 (94.1)
75		93.0 (93.6)	93.6 (94.1)	93.0 (93.6)	93.0 (94.1)	93.0 (94.5)	92.4 (94.1)
100		93.6 (93.6)	93.6 (94.1)	93.0 (93.6)	93.0 (94.1)	93.6 (95.0)	93.0 (94.1)
125		93.6 (94.1)	93.6 (94.1)	93.0 (93.6)	93.0 (94.1)	93.6 (95.0)	93.0 (94.1)
150		93.6 (94.5)	94.1 (94.5)	93.6 (94.5)	94.1 (95.0)	94.1 (95.0)	93.0 (94.1)
200		94.1 (94.5)	94.1 (95.0)	93.6 (95.4)	94.1 (95.0)	94.5 (95.8)	94.1 (95.0)

1/ Performance requirements in parenthesis applicable to equipment manufactured after January 1, 1994.

2/ Efficiency is the ratio of useful output power to total input power expressed as a percent.

### 7813.53 Lighting Equipment

The requirements of this section shall not apply to dwelling units or portions of buildings containing dwelling units.

#### (a) Lighting Controls.

- (1) Each room shall have at least one accessible lighting control to independently activate general lighting within the room.

- (2) All rooms larger than 500 square feet shall have one or more accessible lighting controls so that general lighting may be reduced by at least one-half throughout the room.
- (3) Additional controls shall be provided for general lighting as follows:
- (i) Rooms not intended for 24-hour continuous use shall be provided with automatic controls capable of limiting the hours of lighting use to the occupancy hours of the room.
  - (ii) Rooms intended for 24-hour continuous use shall be provided with not less than one accessible control for each full 500 square feet; provided, however, that a lesser number of controls may be used for rooms that must be used as a whole such as public lobbies, retail sales floors, storerooms, and warehouses.

This requirement shall not apply to lighting for safety and security purposes.

- (4) All lighting for highlighting or special application purposes shall be provided with an accessible lighting control to activate such lighting independently from other lighting within the room.
- (5) Exterior lighting not intended for 24-hour continuous use shall be automatically controlled by a timer, photocell or both. Timers shall be capable of adjustment for seven days and for seasonal daylight variations.

(b) Fluorescent Lamp Ballasts.

- (1) Fluorescent lamp ballasts shall have a ballast efficiency factor no less than the ballast efficiency factor specified in Table 4-14 and shall have a power factor of no less than 0.90. Ballasts designed for use with lamps other than those specified in Table 4-14 are exempt from these requirements.

<b>Table 4-14 Ballast Efficiency Factors</b>			
Ballast designed for the operation of	Nominal input voltage	Total nominal lamp watts <sup>1/</sup>	Ballast efficiency factor <sup>2/</sup>
1 F40T12 lamp	120	40	1.805
	277	40	1.805
2 F40T12 lamps	120	80	1.060
	277	80	1.050
3 F40T12 lamps	120	120	0.710
	277	120	0.710
2 F96T12 lamps	120	150	0.570
	277	150	0.570
2 F96T12HO lamps	120	220	0.390
	277	220	0.390
1/ Input voltage within plus or minus five percent of a specified value.			
2/ The ratio of relative light output to power input.			

- (2) Three-lamp fluorescent luminaires shall be tandem wired. Alternatively, three-lamp ballasts may be used.

## (c) Fluorescent Lamps.

Fluorescent lamps used for general lighting applications must have a lumens per watt (LPW) and color rendering index (CRI) of no less than the values specified in Table 4-15. These requirements shall apply only to the lamp types listed in Table 4-15; all other lamp types are exempt from these requirements.

<b>Table 4-15 Lamp Efficiencies</b>		
Lamp Type	LPW <sup>1/</sup>	CRI
F40T12	75	67
F96T12	80	67
F96T12HO	80	67
F40T12U	68	67
1/ Initial lumen output per watt input		

## (d) Luminaires.

- (1) Luminaires used for general lighting must have a total luminaire efficiency (TLE) no less than the TLE specified in Table 4-16. The following luminaires shall be exempt from this requirement:
  - (i) luminaires designed for use with compact fluorescent lamps;
  - (ii) luminaires designated for use with lamps having a filament design voltage of less than 30 volts;
  - (iii) decorative chandelier-type luminaires that hang from a ceiling and use more than one incandescent lamp; and
  - (iv) luminaires designed and manufactured for a job-specific condition.
- (2) Notwithstanding the requirements specified in paragraph (1) of this subdivision, luminaires which do not conform to the requirements specified in Table 4-16 may be used for general lighting provided that the wattage of such nonconforming luminaires is offset by a reduction in wattage of other conforming luminaires used in the building in accordance with the following procedure:

<b>Table 4-16 Total Luminaire Efficiency (TLE)<sup>1/ 2/</sup> Minimum Performance</b>			
Luminaire Type	Lumen Distribution Characteristics <sup>3/</sup>		
	Narrow > 0.55	Moderate 0.55 - 0.45	Wide <sup>5/</sup> <0.45
<b>Fluorescent Lamps</b>			
Small-cell louver <sup>4/</sup>	25% (40%)	50% (57%)	50% (57%)
Other louver	44% (55%)	53% (62%)	59% (66%)
Wrap -around diffuser/lens	64% (71%)	64% (71%)	64% (71%)
Flat diffuser/lens	53% (64%)	53% (64%)	53% (64%)
All others	33% (49%)	52% (60%)	56% (72%)
<b>All Lumen Distribution Characteristics</b>			
HID lamps	40% (56%)		
Incandescent			
Reflector lamps	47% (66%)		
General service lamps <sup>6/</sup>	46% (59%)		
<p>1/ TLE shall be established through industry standard photometric test procedures based on the most commonly matched lamp and luminaire combination for that luminaire or, where such test results are not available, through an estimate provided by the luminaire manufacturer based on the generally expected performance of the luminaire.</p> <p>2/ Performance requirements in parenthesis applicable to equipment manufactured after January 1, 1995. TLE shall be established through industry standard photometric test procedures.</p> <p>3/ Lumen distribution characteristics are used to categorize luminaires by the fraction of lumens delivered in the 0 to 40 degree segment divided by the lumens delivered in the 0 to 90 degree segment.</p> <p>4/ A small-cell louver luminaire is a luminaire which emits light through a louver with an area of grid opening smaller than 2.5 square inches.</p> <p>5/ Includes luminaires which distribute more than 60% of the emitted light above 90 degrees.</p> <p>6/ Includes decorative lamps.</p>			

For each luminaire to be considered:

- (i) Divide the rated lumen output by the design total luminaire efficiency to establish the design lumens produced by the lamp(s) in the luminaire.
- (ii) Divide the rated lumen output by the conforming total luminaire efficiency for the luminaire (Table 4-16) to establish the conforming lumens that would be produced by the lamp(s) in the luminaire If the luminaire were to conform to the requirements of Table 4-16.

<b>Table 4-17 Typical Lamp/Ballast Efficacies<sup>1/</sup></b>	
Lamp Type	Efficacy
Fluorescent	68
HID-Mercury Vapor	40
HID-Metal Halide	75
Incandescent-Reflector	13
Incandescent-General Service	19
1/ For use only in calculation to determine luminaire offsets in accordance with section 7813.53(d)(2).	

- (i) Divide the design lumens produced by the lamps in the luminaire by the lumens per watt for that lamp type (Table 4-17) to establish the design watts required to produce the rated lumens.
- (ii) Divide the conforming lumens that would be produced by the lamps in the luminaire by the lumens per watt for that lamp type (Table 4-17) to establish the conforming watts that would be required to produce the rated lumens.
- (iii) If the watts used to produce the design lumens exceeds the watts that would be used to produce the conforming lumens, this excess wattage may be offset by reduced wattage of other luminaires.
- (iv) If the watts used to produce the design lumens is less than the watts that would be used to produce the conforming lumens, this wattage may be used to offset excess watts used by other conforming luminaires.

(e) Exit Sign Luminaires.

Luminaires which are designed solely for the illumination of an exit sign shall have a lamp/ballast combined connected wattage of no more than 35 watts.

## 7813.54 Lighting Systems

(a) Building Interiors.

- (1) The lighting power limits specified in Table 4-18 shall be used to establish the maximum building lighting power that may be used for all permanently installed lighting within a building. The lighting power limit is expressed in watts per square foot and includes all power used by the luminaires including lamps, ballasts, current regulators, and lighting controls.

<b>Type 4-18</b>		<b>Lighting Power Limits</b>	
Building Type	Base RCR <sub>0</sub>	Lighting Power Limit (watts/sq ft)	
Office	3.0	2.4	
Store	4.0	2.6	
Mall-concourse	5.0	1.2	
Fast-Food Restaurant	4.0	1.5	
Leisure Restaurant <sup>1/</sup>	4.0	2.0	
Residential <sup>2/</sup>	7.0	1.5	
Education	6.0	2.2	
Health/Hospital	5.0	2.4	
Workshop	3.0	2.7	
Warehouse/Storage	6.0	1.4	
Library	6.0	2.5	
Recreation	6.0	2.2	
Assembly	6.0	1.7	
Auto Service/Dealer	6.0	2.3	
1/ Includes catering/banquet			
2/ Other than dwelling units			

- (2) Selection of the lighting power limit from Table 4-18 shall be based on the predominant use of spaces within the entire building.
- (3) When insufficient information is known about the specific building type, the lighting power limit shall be based on the apparent intended use of the building.
- (4) The total building lighting power shall not include the lighting power used in the following spaces:
- (i) dwelling units or portions of buildings containing dwelling units; and,
  - (ii) spaces containing industrial process equipment.
- (5) The total building lighting power shall not include the lighting power for the following luminaires:
- (i) luminaires used for stage lighting and motion picture or television production;
  - (ii) luminaires used for medical and dental procedures;
  - (iii) luminaires used to highlight art;
  - (iv) luminaires installed within display cases; and,

(v) luminaires used for non-visual applications.

(6) Calculation Procedure

- (i) Using Table 4-18, find the appropriate lighting power limit (LPL) in watts/sq ft according to the building type.
- (ii) Multiply the lighting power limit by the conditioned floor area of the building to obtain the total lighting power in watts allowed for the conditioned floor area of the building.
- (iii) A lighting power limit higher than the LPL's specified in Table 4 -18 may be established if it is determined that the overall room cavity ratio (RCRo) calculated for the building would be higher than the base RCRo in Table 4-18. An adjusted lighting power limit may be calculated as follows:

$$\text{LPL Adjusted} = \text{LPL}(\text{from Table 4 -18}) \times (1 + 0.12 \times (\text{calculated RCR}_0 - \text{base RCR}_0))$$

where:

$$\text{Calculated RCR}_0 = \frac{\text{RCR}_1 A_1 + \text{RCR}_2 A_2 + \dots + \text{RCR}_x A_x}{A_0}$$

$\text{RCR}_x$  = room cavity ratio for each space within a building equal to:

$$\frac{5(\text{cavity high}) \times (\text{length} + \text{width})}{(\text{Length} \times \text{width})}$$

$A_x$  = conditioned floor area at  $\text{RCR}_x$

$A_0$  = total conditioned floor area

(b) Building Exteriors.

For building exteriors, lighting power shall not exceed the values listed in Table 4-19.

<b>Table 4-19 Lighting Power Limits for Building Exteriors</b>	
Location	Lighting Power Limit (watts/sq ft)
Exit (with or without canopy)	20 watts/lin ft of door width
Entrance (without canopy)	30 watts/lin ft of door width
Entrance (with canopy)	10 watts/sq ft of canopies area
Building Exterior Surfaces/Facades	.025 watts/sq ft of building surface

## Part 5

### 7814 Building Design by Acceptable Practice

#### 7814.0 Scope

This Part establishes criteria for the design of residential buildings; provided, however, that such residential buildings shall: contain no more than two dwelling units; have less than 5000 square feet in gross floor area; not exceed three stories in height; and have a wall glazing area that does not exceed 17 percent of the gross wall area.

#### 7814.2 Building Envelope Systems

- (a) Residential buildings regulated by this Part shall be designed in accordance with the thermal performance values listed in Table 5-1. Selection of the appropriate thermal performance requirements shall be dependant on the heating system type that provides comfort conditioning to the majority of the conditioned floor area.
- (b) Foundation wall insulation with the required R-value from Table 5-1 shall start at the top of the foundation wall and extend to either the depth below grade specified in Table 5-2 or to the top of the footing, whichever is less.

Envelope Component	Non-Electric Comfort Heating		Electric Comfort Heating	
	5000-6000 Degree Days	7000-9000 Degree Days	5000-6000 Degree Days	7000-9000 Degree Days
Exterior Wall	R-18	R-18	R-23	R-23
Roof/Ceiling	R-19	R-24	R-26	R-33
Floor	R-19	R-19	R-19	R-24
Foundation Wall	R-10	R-10	R-10	R-10
Slab Edge Insulation	R-10	R-10	R-10	R-10
Glazing	R-1.7	R-1.7	R-2.6	R-2.6
Entrance Doors	R-2.5	R-2.5	R-2.5	R-2.5

<b>Table 5-2</b>		<b>Foundation Insulation Depth</b>	
Degree Days		Depth Below Grade <sup>1/</sup>	
5000		24"	
6000		24"	
7000		48"	
8000		48"	
9000		84"	
1/ For electric comfort heating, the depth of insulation shall be 84 inches for all degree days.			

- (c) All building envelope elements that contain materials which are capable of absorbing or taking up and holding moisture shall be protected by a vapor retarder located on the winter warm side of the insulation.
- (d) Insulation shall be installed in a manner that provides continuity of insulation at plate lines, sill lines, band joists, and corners.
- (e) Floors over unconditioned spaces shall have insulation with the R-value not less than the value given in Table 5-1. Alternatively, foundation walls above and below grade shall have an R-value not less than the applicable values given in Table 5-1; provided, however, that:
- (1) When comfort conditioning is provided to the basement/cellar, the foundation walls above and below grade shall be insulated; and
  - (2) When the space below a floor is exposed to ambient conditions, the space shall be considered to be unconditioned and the floor over that space shall be insulated.
- (f) Slab edge insulation shall extend from the top of the slab to either:
- (1) A minimum depth of 24 inches below grade or below the top of the slab, whichever is greater; or
  - (2) From the top of the slab to the bottom of the slab, and then a horizontal distance of 24 inches beneath the slab.
- (g) Skylights in buildings regulated by this Part shall have an R-value not less than the R-values for glazing in Table 5-1 and shall be no more than one percent of the total roof area.
- (h) Windows shall have air infiltration rates not exceeding 0.37 cfm per linear foot of operable sash crack and doors shall have air infiltration rates not exceeding 0.5 cfm per square foot of door area. Windows and doors shall be tested at a static pressure differential equivalent to the impact pressure of a 25-mph wind.
- (i) All joints and openings in building envelope systems including those around windows and door frames, between walls and roof/ceilings, between walls and floors or foundations, between wall panels, at utility service penetrations, and between dissimilar materials shall be caulked, gasketed, weatherstripped, or otherwise sealed.
- (j) An air infiltration barrier shall be installed wherever a ventilated siding material is installed or the siding installation technique necessitates a loose-fitting application.
- (k) All fireplace units shall have infiltration losses with the damper in the closed position not to exceed 20

cfm at 0.3 inches water gauge. If the damper alone does not meet this requirement, tight fitting noncombustible fireplace doors shall be used.

- (l) All fireplace units shall be provided with a source of combustion air, ducted from the outdoors, of sufficient quantity to support combustion. This source shall be equipped with a damper capable of being fully closed.
- (m) No device installed in a fireplace that uses a gaseous fuel for its operation shall be equipped with a continuously operated standing pilot light.

#### **7814.11 Performance of HVAC Equipment**

All HVAC equipment shall meet the efficiency requirements shown in Table 5-3.

#### **7814.12 Control of HVAC Systems**

- (a) Temperature control. Each dwelling unit shall be provided with at least one thermostat capable of automatically adjusting space temperature. Each thermostat shall have a minimum range of temperature settings from 45°F to 85°F and shall be capable of providing a deadband of no less than 5°F between full heating and cooling.
- (b) Zoning. An accessible manual or automatic means shall be provided to restrict or shut off the heating and/or cooling to each terminal unit.

#### **7814.13 Duct Systems**

- (a) Insulation with a minimum thickness of no less than 1" shall be installed on any supply air ducts located outside of a conditioned space.
- (b) All transverse joints on supply air ducts located outside of a conditioned space shall be sealed with adhesives, sealants, gaskets, tape systems, or combinations thereof.

#### **7814.14 Ventilation Systems**

Supply and exhaust air intakes and outlets shall be equipped with tight shutoff dampers at the building envelope to minimize air leakage.

#### **7814.15 Insulation of Piping Systems**

- (a) Insulation with a minimum thickness of no less than 1 1/2" shall be installed on any space heating distribution piping located outside of a conditioned space.
- (b) Insulation with a minimum thickness of no less than 3/4" shall be installed on any service water distribution piping that is greater than 3/4" in diameter.

#### **7814.21 Service Water Heating Systems and Equipment**

- (a) Water heaters including pool heaters shall meet the efficiency requirements shown in Table 5-4.
- (b) Pool heaters that use a gaseous fuel other than propane shall not be equipped with a continuously operated standing pilot light.
- (c) Service water heating systems shall be equipped with automatic temperature controls, capable of adjustment from the lowest to the highest acceptable temperature settings for the intended use.

- (1) A separate switch shall be provided to permit turning off the energy supplied to electric water heaters.
- (2) A separate valve shall be provided to permit turning off the energy supplied to the main burner or burners of gas- and oil-fired water heaters.
- (3) All pool heaters shall be equipped with an accessible on-off switch to allow shutting off the operation of the water heating system without adjusting the thermostat setting.

### 7814.31 Electrical Systems

Each dwelling unit shall be provided with a separate electric meter.

<b>Table 5-3 HVAC Equipment Minimum Performance<sup>1/</sup></b>		
<b>Furnaces</b>		
Gas-Fired	70% AFUE	(78% AFUE)
Oil-Fired	75% AFUE	(78% AFUE)
<b>Boilers</b>		
Gas-Fired	70% AFUE	(80% AFUE)
Oil-Fired	75% AFUE	(80% AFUE)
<b>Central Air Conditioners</b>		
Split System	9.5 SEER	(10.0 SEER)
Single Package	9.5 SEER	9.7 SEER <sup>2/</sup> )
<b>Heat Pumps</b>		
Split System	8.5 SEER	(10.0 SEER)
	2.6 COP @ 47°F db	(6.8 HSPF)
Single Package	8.5 SEER	(9.7 SEER <sup>2/</sup> )
	2.6 COP @ 47°F db	(6.6 HSPF <sup>2/</sup> )
1/ Except as provided in footnote 2, performance requirements in parenthesis applicable to equipment manufactured after January 1, 1993.		
2/ Applicable to single package systems manufactured after January 1, 1993.		

<b>Table 5-4 Service Water Heating Equipment Minimum Performance<sup>1/</sup></b>		
<b>Storage</b>		
Electric	$EF \geq 0.93 - 0.00132v$	
Gas-Fired	$EF \geq 0.62 - 0.0019V$	
Oil-Fired	$EF \geq 0.59 - 0.0019V$	
<b>Instantaneous</b>		
Gas-Fired	$TE \geq 75\%$	( $TE \geq 80\%$ )
Oil-Fired	$CE \geq 80\%$	( $CE \geq 83\%$ )
Pool Heaters	$TE \geq 78\%$	
1/ Performance requirements in parenthesis applicable to equipment manufactured after January 1, 1992.		

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## Part 6

### 7815 Building Design by Thermal Rating Method

#### 7815.1 Scope

This Part establishes criteria for the design of all residential buildings containing one or two dwelling units and to residential buildings containing three or more dwelling units where such buildings are three stories or less in height and in which dwelling units comprise the majority of conditioned floor area.

#### 7815.2 Building Envelope Systems

- (a) Compliance with this Part will require that the total thermal rating of a building envelope design shall be no less than zero.
- (b) All building envelope elements that contain materials which are capable of absorbing or taking up and holding moisture shall be protected by a vapor retarder located on the winter warm side of the insulation.
- (c) Insulation shall be installed in a manner that provides continuity of insulation at plate lines, sill lines, band joists and corners. Whenever continuity of insulation is broken at walls separating dwelling units, such walls shall be insulated to no less than R-10 on each side of the break in insulation continuity.
- (d) Floors over unconditioned spaces shall be insulated. Alternatively, foundation walls above and below grade shall be insulated; provided, however, that:
  - (1) when comfort conditioning is provided to the basement/cellar, the foundation walls above and below grade shall be insulated; and
  - (2) when the space below a floor is exposed to ambient conditions, the space shall be considered to be unconditioned and the floor over that space shall be insulated.
- (e) Slab edge insulation shall extend from the top of the slab to either:
  - (1) a minimum depth of 24 inches below grade or below the top of the slab, whichever is greater; or
  - (2) from the top of the slab to the bottom of the slab, and then a horizontal distance of 24 inches beneath the slab.
- (f) Air infiltration shall be limited in accordance with the provisions of section 7813.4 of this Title.
- (g) Fireplaces shall be constructed in accordance with the provisions of section 7813.5 of this Title.

#### 7815.3 Methodology

- (a) The total thermal rating of a building envelope design shall be the sum of the individual thermal ratings for each applicable building envelope component established through the use of the Tables listed in Charts 6-A and 6-B (see section 7815.32 of this Part) for buildings containing two dwelling units or less or Charts 6M-A and 6M-B for buildings containing more than two dwelling units.

- (b) Tables used to determine compliance with this Part are organized as follows:
- (1) Tables 6-1 through 6-8 are for buildings containing two dwelling units or less and in which non-electric comfort heating is provided to the majority of the conditioned floor area.
  - (2) Tables 6-1E through 6-6E are for buildings containing two dwelling units or less and in which electric comfort heating is provided to the majority of the conditioned floor area.
  - (3) Tables 6M-1 through 6M-8 are for buildings containing more than two dwelling units and in which non-electric comfort heating is provided to the majority of the conditioned floor area.
  - (4) Tables 6M-1E through 6M-7E are for buildings containing more than two dwelling units and in which electric comfort heating is provided to the majority of the conditioned floor area.
- (c) To use the thermal rating tables, it is necessary to determine the thermal performance values and areas or lengths for each building envelope component.
- (d) The thermal rating for each building envelope component shall be determined as follows:
- (1) From the top of the applicable thermal rating table, select the column that contains the appropriate thermal performance value range that correctly corresponds to the actual value of the building envelope component.
  - (2) From the left side of the thermal rating table, select the row that contains the appropriate area or length range that correctly corresponds to the actual value of the building envelope component.
  - (3) Read across and down; the thermal rating is determined at the point of intersection of the thermal performance value column and area or length row.
- (e) If the area or length of the building envelope component exceeds the maximum area or length provided on the appropriate thermal rating table, the actual area shall be divided into two or more partial components to determine preliminary thermal ratings. The sum of the preliminary thermal ratings for these partial components will yield the actual thermal rating for the building envelope component; provided, however, that:
- (1) the maximum area or length provided on the Thermal Rating Table must be used whenever possible to break the actual building envelope component into two or more partial components; and
  - (2) each table will be accessed the minimum number of times to establish preliminary thermal ratings for each building envelope component.
- (f) The total thermal rating for a building shall be the sum of the thermal ratings established through use of the tables listed in Chart 6-A, Chart 6-B, Chart 6M-A, or Chart 6M-B for each applicable feature of the building envelope.

### **7815.11 Performance of HVAC Equipment**

All HVAC equipment shall meet the requirements of section 7813.21 of this Code.

### **7815.12 Control of HVAC Systems**

All mechanical system controls shall meet the requirements of section 7813.13 of this Code.

**7815.13 Duct Systems**

All duct systems shall meet the requirements of sections 7813.19 and 7813.20 of this Code.

**7815.14 Ventilation Systems**

Ventilation systems shall meet the requirements of section 7813.16 of this Code.

**7815.15 Insulation of Piping Systems**

All space heating and service water heating distribution piping shall meet the requirements of section 7813.18 of this Code.

**7815.21 Service Water Heating Systems and Equipment**

All service water heating systems shall meet the requirements of sections 7813.31 through 7813.34 of this Code.

**7815.31 Electrical and Lighting Systems and Equipment**

All electrical and lighting systems and equipment shall meet the requirements of section 7813.52 through 7813.54 of this Code.

<b>Chart 6-A Thermal Rating Tables for All Residential Buildings Containing One or Two Dwelling Units with Non-electric Comfort Heating</b>					
<b>Envelope Component</b>	<b>Degree Days</b>				
	5000	6000	7000	8000	9000
Net Walls	Table 6-1	Table 6-1	Table 6-2	Table 6-2	Table 6-2
Glazing	Table 6-1	Table 6-1	Table 6-2	Table 6-2	Table 6-2
Doors	Table 6-1	Table 6-1	Table 6-2	Table 6-2	Table 6-2
Roof/Ceiling, Skylight Glazing	Table 6-3	Table 6-3	Table 6-4	Table 6-4	Table 6-4
Floors	Table 6-3	Table 6-3	Table 6-3	Table 6-3	Table 6-3
Foundation Walls	Table 6-5	Table 6-5	Table 6-6	Table 6-6	Table 6-7
Slab Insulation	Table 6-8	Table 6-8	Table 6-8	Table 6-8	Table 6-8

<b>Chart 6-B Thermal Rating Tables for All Residential Buildings Containing One or Two Dwelling Units with Electric Comfort Heating</b>					
<b>Envelope Component</b>	<b>Degree Days</b>				
	5000	6000	7000	8000	9000
Net Walls	Table 6-1E	Table 6-1E	Table 6-1E	Table 6-1E	Table 6-1E
Glazing	Table 6-1E	Table 6-1E	Table 6-1E	Table 6-1E	Table 6-1E
Doors	Table 6-1E	Table 6-1E	Table 6-1E	Table 6-1E	Table 6-1E
Roof/Ceiling, Skylight Glazing	Table 6-2E	Table 6-2E	Table 6-3E	Table 6-3E	Table 6-3E
Floors	Table 6-4E	Table 6-4E	Table 6-2E	Table 6-2E	Table 6-2E
Foundation Walls	Table 6-5E	Table 6-5E	Table 6-5E	Table 6-5E	Table 6-5E
Slab Insulation	Table 6-6E	Table 6-6E	Table 6-6E	Table 6-6E	Table 6-6E

**Table 6-1 Thermal Ratings Net Walls, Glazing or Doors: 5000 - 6000 Degree Days, One or Two Dwelling Units**

Net Component Area	U-Value of Component																								
	< .026	.026 to .033	.034 to .040	.041 to .050	.051 to .059	.060 to .071	.072 to .090	.091 to .100	.101 to .110	.111 to .120	.121 to .130	.131 to .140	.141 to .150	.151 to .160	.161 to .170	.171 to .190	.191 to .236	.237 to .262	.263 to .294	.295 to .335	.336 to .390	.391 to .467	.486 to .582	.583 to .770	> .770
1 -50	3	3	3	3	3	2	2	2	1	1	1	1	0	0	0	-1	-2	-3	-3	-4	-6	-8	-11	-16	-24
51 -100	10	10	9	8	8	7	5	5	4	3	2	2	1	0	-1	-2	-6	-8	-10	-13	-17	-23	-32	-46	-71
101 -150	17	16	15	14	13	11	9	8	6	5	4	3	1	0	-1	-4	-9	-13	-17	-22	-29	-39	-53	-77	-118
151 -200	24	22	21	19	18	16	12	11	9	7	5	4	2	0	-2	-5	-13	-18	-23	-31	-40	-54	-74	-107	-165
201 -250	30	29	27	25	23	20	16	14	11	9	7	5	2	0	-2	-7	-17	-23	-30	-40	-52	-69	-95	-138	-212
251 -350	41	38	36	33	30	27	21	18	15	12	9	6	3	0	-3	-6	-20	-27	-40	-53	-69	-92	-127	-183	-282
351 -450	54	51	48	44	41	35	28	24	20	16	12	8	4	0	-4	-8	-26	-37	-54	-70	-92	-123	-169	-244	-376
451 -550	68	63	60	55	51	44	35	30	25	20	15	10	5	0	-5	-10	-33	-46	-67	-88	-115	-154	-211	-306	-470
551 -650	81	76	72	66	61	53	42	36	30	24	18	12	6	0	-6	-12	-39	-55	-80	-105	-138	-185	-253	-367	
651 -750	95	89	84	77	71	62	49	42	35	28	21	14	7	0	-7	-14	-46	-64	-94	-123	-161	-215	-295	-428	
751 -900	111	105	99	91	84	73	58	50	41	33	25	17	8	0	-8	-25	-62	-84	-111	-145	-190	-254	-348		
901 -1050	132	124	117	107	99	86	68	59	49	39	29	20	10	0	-10	-29	-74	-99	-131	-171	-225	-300	-411		
1051 -1200	152	143	135	124	114	100	79	68	56	45	34	23	11	0	-11	-34	-85	-114	-151	-197	-259	-346	-475		
1201 -1350	172	162	153	140	129	113	89	77	64	51	38	26	13	0	-13	-38	-96	-129	-171	-224	-294	-392			
1351 -1500	192	181	171	157	144	126	100	86	71	57	43	29	14	0	-14	-43	-108	-145	-191	-250	-329	-438			
1501 -1700	216	203	192	176	162	142	112	96	80	64	48	32	16	0	-16	-48	-121	-162	-214	-281	-369	-492			
1701 -1900	243	228	216	198	182	159	126	108	90	72	54	36	18	0	-18	-54	-136	-183	-241	-316	-415				
1901 -2100	270	253	240	220	202	177	140	120	100	80	60	40	20	0	-20	-60	-151	-203	-268	-351	-461				
2101 -2300	297	270	264	242	223	195	154	132	110	88	66	44	22	0	-22	-66	-166	-223	-295	-386					
2301 -2500	324	304	288	264	243	213	168	144	120	96	72	48	24	0	-24	-72	-181	-224	-321	-421					
2501 -2750	354	333	315	289	266	233	184	158	131	105	79	53	26	0	-26	-79	-198	-267	-351	-460					
2751 -3000	388	364	345	316	291	255	201	173	144	115	86	58	29	0	-29	-86	-217	-292	-385						
3001 -3250	422	396	375	344	316	277	219	188	156	125	94	63	31	0	-31	-94	-236	-317	-418						
3250 -3500	456	428	405	371	342	299	236	203	169	135	101	68	34	0	-34	-101	-255	-343	-452						
3501 -3750	489	459	435	399	367	321	254	218	181	145	109	73	36	0	-36	-109	-274	-368	-485						

**Not Permitted**

**Table 6-2 Thermal Ratings Net Walls, Glazing or Doors: 7000 - 9000 Degree Days, One or Two Dwelling Units**

Net Component Area	U-Value of Component																								
	< .026	.026 to .033	.034 to .040	.041 to .050	.051 to .059	.060 to .071	.072 to .090	.091 to .100	.101 to .110	.111 to .120	.121 to .130	.131 to .140	.141 to .150	.151 to .160	.161 to .170	.171 to .190	.191 to .236	.237 to .262	.263 to .294	.295 to .335	.336 to .390	.391 to .467	.486 to .582	.583 to .770	> .770
1 -50	3	3	3	3	2	2	2	1	1	1	1	0	0	0	-1	-1	-2	-3	-4	-5	-6	-8	-11	-16	-24
51 -100	9	9	8	8	7	6	5	4	3	2	2	1	0	-1	-2	-3	-6	-8	-11	-14	-18	-24	-33	-47	-72
101 -150	16	15	14	13	11	10	8	6	5	4	3	1	0	-1	-3	-5	-11	-14	-18	-23	-30	-40	-54	-78	-119
151 -200	22	20	19	18	16	14	11	9	7	5	4	2	0	-2	-4	-7	-15	-20	-25	-33	-42	-56	-76	-109	-167
201 -250	28	26	25	23	21	18	14	11	9	7	5	2	0	-2	-5	-9	-19	-25	-32	-42	-54	-72	-97	-140	-214
251 -350	38	35	33	30	27	24	18	15	12	9	6	3	0	-3	-6	-12	-26	-34	-43	-56	-72	-95	-130	-186	-285
351 -450	50	47	44	40	37	31	24	20	16	12	8	4	0	-4	-8	-16	-34	-45	-58	-74	-96	-127	-173	-248	-380
451 -550	63	58	55	50	46	39	30	25	20	15	10	5	0	-5	-10	-20	-43	-56	-72	-93	-120	-159	-216	-311	-475
551 -650	75	70	66	60	55	47	36	30	24	18	12	6	0	-6	-12	-24	-51	-67	-86	-111	-144	-191	-259	-373	
651 -750	88	82	77	70	64	55	42	35	28	21	14	7	0	-7	-14	-28	-60	-78	-101	-130	-168	-222	-302	-435	
751 -900	103	96	91	83	75	65	50	41	33	25	17	8	0	-8	-17	-33	-71	-92	-119	-153	-199	-262	-356		
901 -1050	122	114	107	98	89	77	59	49	39	29	20	10	0	-10	-20	-39	-83	-109	-140	-181	-235	-310	-421		
1051 -1200	141	131	124	113	103	88	68	56	45	34	23	11	0	-11	-23	-45	-96	-126	-162	-209	-271	-357	-486		
1201 -1350	159	149	140	128	116	100	77	64	51	38	26	13	0	-13	-26	-51	-109	-142	-183	-236	-307	-405			
1351 -1500	178	166	157	143	130	112	86	71	57	43	29	14	0	-14	-29	-57	-122	-159	-205	-264	-343	-452			
1501 -1700	200	187	176	160	146	126	96	80	64	48	32	16	0	-16	-32	-64	-137	-178	-230	-297	-385				
1701 -1900	225	210	198	180	164	141	108	90	72	54	36	18	0	-18	-36	-72	-154	-201	-259	-334	-433				
1901 -2100	250	233	220	200	182	157	120	100	80	60	40	20	0	-20	-40	-80	-171	-223	-288	-371	-481				
2101 -2300	275	257	242	220	201	173	132	110	88	66	44	22	0	-22	-44	-88	-188	-245	-317	-408					
2301 -2500	300	280	264	240	219	189	144	120	96	72	48	24	0	-24	-48	-96	-205	-268	-345	-445					
2501 -2750	328	306	289	263	239	206	158	131	105	79	53	26	0	-26	-53	-105	-225	-293	-378	-487					
2751 -3000	359	335	316	288	262	226	173	144	115	86	58	29	0	-29	-58	-115	-246	-321	-414						
3001 -3250	391	365	344	313	285	246	188	156	125	94	63	31	0	-31	-63	-125	-267	-349	-450						
3250 -3500	422	394	371	338	308	265	203	169	135	101	68	34	0	-34	-68	-135	-289	-376	-486						
3501 -3750	453	423	399	363	331	285	218	181	145	109	73	36	0	-36	-73	-145	-310	-404							

**Not Permitted**

**Table 6-3 Thermal Ratings Roof/Ceiling and Skylight Glazing: 5000 - 6000 Degree Days, Floors: All Degree Days One or Two Dwelling Units**

Net Component Area	U-Value of Component																								
	< .023	.023 to .025	.026 to .030	.031 to .035	.036 to .040	.041 to .045	.046 to .050	.051 to .055	.056 to .060	.061 to .065	.066 to .070	.071 to .090	.091 to .110	.111 to .135	.136 to .175	.176 to .200	.201 to .236	.237 to .262	.263 to .294	.295 to .335	.336 to .390	.391 to .467	.468 to .582	.583 to .770	> .770
1 -50	1	1	1	0	0	0	0	0	0	0	-1	-1	-2	-2	-3	-4	-5	-5	-6	-7	-9	-11	-14	-18	-27
51 -100	2	2	2	1	1	0	0	0	-1	-1	-2	-3	-5	-6	-9	-11	-14	-16	-18	-22	-26	-32	-40	-54	-79
101 -150	4	3	3	2	1	1	0	-1	-1	-2	-3	-5	-8	-11	-16	-19	-23	-27	-31	-36	-43	-52	-67	-90	-132
151 -200	5	4	4	3	2	1	0	-1	-2	-3	-4	-7	-11	-15	-22	-26	-33	-37	-43	-50	-60	-73	-93	-126	-184
201 -250	6	6	5	3	2	1	0	-1	-2	-3	-5	-9	-14	-19	-28	-34	-42	-48	-55	-64	-77	-94	-120	-162	-237
251 -350	8	8	6	5	3	2	0	-2	-3	-5	-6	-12	-18	-26	-38	-45	-56	-64	-73	-86	-102	-125	-160	-216	-316
351 -450	11	10	8	6	4	2	0	-2	-4	-6	-8	-16	-24	-34	-50	-60	-74	-85	-98	-114	-136	-167	-213	-289	-421
451 -550	14	13	10	8	5	3	0	-3	-5	-8	-10	-20	-30	-43	-63	-75	-93	-106	-122	-143	-170	-209	-266	-361	
551 -650	17	15	12	9	6	3	0	-3	-6	-9	-12	-24	-36	-51	-75	-90	-111	-127	-146	-171	-204	-251	-319	-433	
651 -750	20	18	14	11	7	4	0	-4	-7	-11	-14	-28	-42	-60	-88	-105	-130	-148	-171	-200	-239	-292	-372		
751 -900	23	21	17	12	8	4	0	-4	-8	12	-17	-33	-50	-70	-103	-124	-153	-175	-201	-236	-281	-344	-439		
901 -1050	27	24	20	15	10	5	0	-5	-10	-15	-20	-39	-59	-83	-122	-146	-181	-206	-238	-278	-332	-407			
1051 -1200	32	28	23	17	11	6	0	-6	-11	-17	-23	-45	-68	-96	-141	-169	-209	-238	-274	-321	-383	-470			
1201 -1350	36	32	26	19	13	6	0	-6	-13	-19	-26	-51	-77	-108	-159	-191	-237	-270	-311	-364	-434				
1351 -1500	40	36	29	21	14	7	0	-7	-14	-21	-29	-57	-86	-121	-178	-214	-265	-302	-348	-407	-485				
1501 -1700	45	40	32	24	16	8	0	-8	-16	-24	-32	-64	-96	-136	-200	-240	-297	-339	-390	-457					
1701 -1900	50	45	36	27	18	9	0	-9	-18	-27	-36	-72	-108	-153	-225	-270	-334	-381	-439						
1901 -2100	56	50	40	30	20	10	0	-10	-20	-30	-40	-80	-120	-170	-250	-300	-371	-423	-488						
2101 -2300	62	55	44	33	22	11	0	-11	-22	-33	-44	-88	-132	-187	-275	-330	-408	-465							
2301 -2500	67	60	48	36	24	12	0	-12	-24	-36	-48	-96	-144	-204	-300	-360	-445								
2501 -2750	74	66	53	39	26	13	0	-13	-26	-39	-53	-105	-158	-223	-328	-394	-487								
2751 -3000	81	72	58	43	29	14	0	-14	-29	-43	-58	-115	-173	-244	-359	-431									
3001 -3250	88	78	63	47	31	16	0	-16	-31	-47	-63	-125	-188	-266	-391	-469									
3250 -3500	95	84	68	51	34	17	0	-17	-34	-51	-68	-135	-203	-287	-422										
3501 -3750	102	91	73	54	36	18	0	-18	-36	-54	-73	-145	-218	-308	-453										

**Not Permitted**

**Table 6-4 Thermal Ratings Roof/Ceiling and Skylight Glazing: 7000 - 9000 Degree Days, Floors: All Degree Days One or Two Dwelling Units**

Net Component Area	U-Value of Component																								
	< .023	.023 to .025	.026 to .030	.031 to .035	.036 to .040	.041 to .045	.046 to .050	.051 to .055	.056 to .060	.061 to .065	.066 to .070	.071 to .090	.091 to .110	.111 to .135	.136 to .175	.176 to .200	.201 to .236	.237 to .262	.263 to .294	.295 to .335	.336 to .390	.391 to .467	.468 to .582	.583 to .770	> .770
1 -50	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-2	-2	-3	-4	-5	-6	-6	-8	-9	-11	-14	-19	-27
51 -100	1	1	1	0	0	0	-1	-1	-2	-2	-2	-4	-5	-7	-10	-12	-15	-17	-19	-22	-26	-32	-41	-55	-80
101 -150	2	2	1	1	0	-1	-1	-2	-3	-3	-4	-6	-9	-12	-17	-20	-25	-28	-32	-37	-44	-54	-68	-92	-133
151 -200	3	3	2	1	0	-1	-2	-3	-4	-4	-5	-9	-12	-17	-24	-28	-34	-39	-45	-52	-62	-75	-95	-128	-186
201 -250	4	3	2	1	0	-1	-2	-3	-5	-6	-7	-11	-16	-21	-30	-36	-44	-50	-57	-67	-79	-96	-122	-165	-239
251 -350	5	5	3	2	0	-2	-3	-5	-6	-8	-9	-15	-21	-29	-41	-48	-59	-67	-76	-89	-105	-128	-163	-219	-319
351 -450	7	6	4	2	0	-2	-4	-6	-8	-10	-12	-20	-28	-38	-54	-64	-78	-89	-102	-118	-140	-171	-217	-293	-425
451 -550	9	8	5	3	0	-3	-5	-8	-10	-13	-15	-25	-35	-48	-68	-80	-98	-111	-127	-148	-175	214	-271	-366	
551 -650	11	9	6	3	0	-3	-6	-9	-12	-15	-18	-30	-42	-57	-81	-96	-118	-133	-152	-177	-210	-257	-325	-439	
651 -750	13	11	7	4	0	-4	-7	-11	-14	-18	-21	-35	-49	-67	-95	-112	-137	-155	-178	-207	-246	-299	-379		
751 -900	15	12	8	4	0	-4	-8	-12	-17	-21	-25	-41	-58	-78	-111	-132	-161	-183	-210	-244	-289	-353	-447		
901 -1050	18	15	10	5	0	-5	-10	-15	-20	-24	-29	-49	-68	-93	-132	-156	-191	-216	-248	-288	-342	-417			
1051 -1200	20	17	11	6	0	-6	-11	-17	-23	-28	-34	-56	-79	-107	-152	-180	-220	-249	-286	-332	-394	-481			
1201 -1350	23	19	13	6	0	-6	-13	-19	-26	-32	-38	-64	-89	-121	-172	-204	-249	-283	-324	-377	-447				
1351 -1500	26	21	14	7	0	-7	-14	-21	-29	-36	-43	-71	-100	-135	-192	-228	-279	-316	-362	-421					
1501 -1700	29	24	16	8	0	-8	-16	-24	-32	-40	-48	-80	-112	-152	-216	-256	-313	-355	-406	-473					
1701 -1900	32	27	18	9	0	-9	-18	-27	-36	-45	-54	-90	-126	-171	-243	-288	-352	-399	-457						
1901 -2100	36	30	20	10	0	-10	-20	-30	-40	-50	-60	-100	-140	-190	-270	-320	-391	-443							
2101 -2300	40	33	22	11	0	-11	-22	-33	-44	-55	-66	-110	-154	-209	-297	-352	-430	-487							
2301 -2500	43	36	24	12	0	-12	-24	-36	-48	-60	-72	-120	-168	-228	-324	-384	-469								
2501 -2750	47	39	26	13	0	-13	-26	-39	-53	-66	-79	-131	-184	-249	-354	-420									
2751 -3000	52	43	29	14	0	-14	-29	-43	-58	-72	-86	-144	-201	-273	-388	-460									
3001 -3250	56	47	31	16	0	-16	-31	-47	-63	-78	-94	-156	-219	-297	-422										
3250 -3500	61	51	34	17	0	-17	-34	-51	-68	-84	-101	-169	-236	-321	-456										
3501 -3750	65	54	36	18	0	-18	-36	-54	-73	-91	-109	-181	-254	-344	-489										

**Not Permitted**

<b>Table 6-5 Thermal Ratings Foundation Walls: 5000 - 6000 Degree Days, One or Two Dwelling Units</b>																			
Foundation Wall Perimeter in Linear Feet	Exposure Above Grade in Feet	$U_w \leq 0.060$			$0.061 < U_w \leq 0.090$			$0.091 < U_w \leq 0.110$			$0.111 < U_w \leq 0.150$			$0.151 < U_w \leq 0.190$			$0.191 < U_w \leq 0.220$		
		to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth
Less than 50	1	21	14	4	15	9	1	10	5	-2	2	-1	-7	-3	-6	-12	-8	-10	-15
	2	20	14	5	13	8	0	7	3	-4	-3	-6	-12	-10	-13	-18	-16	-18	-22
	3	18	16	6	10	8	0	4	2	-6	-8	-9	-15	-17	-18	-23	-24	-25	-29
	4	18	18	8	9	9	0	1	1	-6	-12	-12	-18	-23	-23	-28	-31	-31	-35
50 - 99	1	31	21	7	22	14	1	15	8	-3	4	-2	-11	-5	-10	-17	-12	-15	-22
	2	29	22	7	19	13	0	10	5	-7	-4	-8	-17	-15	-19	-27	-23	-27	-34
	3	28	23	9	16	12	-1	5	2	-8	-11	-14	-23	-25	-27	-35	-35	-37	-44
	4	26	26	11	13	13	1	2	2	-10	-18	-18	-27	-35	-35	-42	-47	-47	-53
100 - 149	1	52	35	11	37	23	2	25	13	-5	6	-3	-18	-9	-16	-29	-20	-26	-37
	2	49	36	12	32	21	0	17	8	-11	-7	-14	-29	-25	-31	-44	-39	-44	-56
	3	46	39	15	26	20	-1	9	4	-14	-19	-23	-38	-42	-45	-58	-59	-62	-73
	4	44	44	19	22	22	1	3	3	-16	-30	-30	-45	-58	-58	-70	-78	-78	-88
150 - 199	1	73	49	15	52	32	3	35	18	-7	8	-4	-25	-12	-22	-41	-27	-36	-52
	2	69	50	17	45	29	0	24	11	-15	-10	-20	-41	-35	-44	-62	-54	-62	-78
	3	64	55	21	36	28	-1	13	6	-20	-27	-32	-53	-59	-63	-81	-82	-87	-103
	4	62	62	27	31	31	1	4	4	-22	-42	-42	-63	-81	-81	-97	-110	-110	-123
200 - 249	1	94	63	20	67	41	4	45	23	-9	11	-5	-32	-15	-29	-52	-35	-46	-67
	2	88	65	22	58	38	0	31	14	-20	-13	-25	-52	-45	-57	-80	-70	-80	-101
	3	83	70	27	47	36	-2	16	7	-25	-34	-41	-68	-75	-81	-105	-106	-111	-132
	4	79	79	34	40	40	2	5	5	-29	-54	-54	-81	-104	-104	-125	-141	-141	-158
250 - 299	1	114	77	24	81	51	4	55	29	-11	13	-7	-40	-19	-35	-64	-43	-57	-82
	2	108	79	26	70	46	0	37	18	-24	-15	-31	-64	-55	-69	-98	-85	-98	-123
	3	101	86	33	57	44	-2	20	9	-31	-42	-51	-84	-92	-99	-128	-130	-136	-161
	4	97	97	42	48	48	2	7	7	-35	-66	-66	-99	-127	-127	-153	-172	-172	-194
300 - 350	1	135	91	29	96	60	5	65	34	-13	16	-8	-47	-22	-42	-75	-51	-67	-97
	2	127	94	31	83	55	0	44	21	-29	-18	-36	-75	-66	-82	-115	-101	-116	-145
	3	120	101	39	68	52	-3	23	10	-36	-49	-60	-99	-109	-118	-151	-153	-161	-191
	4	114	114	49	57	57	3	8	8	-42	-78	-78	-117	-150	-150	-181	-204	-204	-229

<b>Table 6-6 Thermal Ratings Foundation Walls: 7000 - 8000 Degree Days, One or Two Dwelling Units</b>																			
Foundation Wall Perimeter in Linear Feet	Exposure Above Grade in Feet	$U_w \leq 0.060$			$0.061 < U_w \leq 0.090$			$0.091 < U_w \leq 0.110$			$0.111 < U_w \leq 0.150$			$0.151 < U_w \leq 0.190$			$0.191 < U_w \leq 0.220$		
		to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth
Less than 50	1	12	6	-4	6	1	-8	2	-3	-10	-6	-10	-16	-12	-15	-20	-16	-19	-23
	2	11	6	-4	4	0	-8	-2	-5	-13	-11	-14	-20	-18	-21	-26	-24	-26	-31
	3	10	7	-2	2	0	-9	-5	-7	-14	-16	-18	-24	-25	-26	-32	-32	-33	-38
	4	9	9	-1	0	0	-8	-7	-7	-15	-20	-20	-26	-31	-31	-36	-40	-40	-44
50 - 99	1	19	8	-6	10	1	-11	2	-5	-16	-9	-14	-23	-18	-22	-30	-24	-28	-35
	2	17	9	-5	7	0	-13	-2	-8	-19	-17	-21	-30	-28	-31	-39	-36	-39	-46
	3	15	11	-4	3	-1	-13	-7	-10	-21	-24	-26	-35	-38	-40	-48	-48	-50	-57
	4	14	14	-1	1	1	-12	-11	-11	-22	-31	-31	-40	-47	-47	-54	-60	-60	-65
100 - 149	1	31	14	-10	16	2	-19	4	-8	-26	-15	-24	-39	-30	-37	-50	-41	-47	-58
	2	28	15	-9	11	0	-21	-4	-13	-32	-28	-35	-50	-46	-52	-65	-60	-65	-77
	3	25	18	-6	5	-1	-22	-12	-17	-35	-40	-44	-59	-63	-66	-79	-80	-83	-94
	4	23	23	-2	1	1	-20	-18	-18	-37	-51	-51	-66	-79	-79	-91	-99	-99	-109
150 - 199	1	43	20	-14	22	3	-27	6	-11	-36	-21	-34	-55	-41	-52	-70	-57	-65	-82
	2	39	21	-13	15	0	-29	-6	-18	-45	-39	-49	-70	-65	-73	-92	-84	-92	-108
	3	35	25	-8	7	-1	-31	-17	-24	-49	-56	-62	-83	-88	-93	-111	-112	-116	-132
	4	32	32	-3	1	1	-28	-25	-25	-52	-71	-71	-92	-110	-110	-127	-139	-139	-153
200 - 249	1	56	25	-18	29	4	-34	7	-14	-47	-27	-43	-70	-53	-67	-90	-73	-84	-105
	2	50	27	-16	20	0	-38	-7	-23	-58	-50	-63	-90	-83	-94	-118	-108	-118	-139
	3	45	32	-11	9	-2	-40	-22	-31	-63	-72	-79	-106	-113	-119	-143	-144	-149	-170
	4	41	41	-4	2	2	-36	-32	-32	-67	-92	-92	-119	-141	-141	-163	-179	-179	-196
250 - 299	1	68	31	-22	35	4	-42	9	-18	-57	-33	-53	-86	-65	-81	-110	-89	-103	-110
	2	62	33	-20	24	0	-46	-9	-29	-70	-62	-77	-110	-102	-115	-144	-132	-144	-169
	3	55	40	-13	11	-2	-48	-26	-37	-77	-88	-97	-130	-138	-146	-174	-176	-182	-208
	4	51	51	-4	2	2	-44	-40	-40	-81	-112	-112	-145	-173	-173	-199	-218	-218	-240
300 - 350	1	81	36	-26	42	5	-49	10	-21	-68	-39	-62	-101	-77	-96	-130	-105	-122	-151
	2	73	39	-23	29	0	-55	-10	-34	-83	-73	-91	-130	-120	-136	-170	-156	-170	-200
	3	65	47	-16	13	-3	-57	-31	-44	-91	-104	-114	-153	-163	-172	-206	-208	-215	-245
	4	60	60	-5	3	3	-52	-47	-47	-96	-133	-133	-172	-204	-204	-236	-258	-258	-284

<b>Table 6-7 Thermal Ratings Foundation Walls: 9000 Degree Days, One or Two Dwelling Units</b>																			
Foundation Wall Perimeter in Linear Feet	Exposure Above Grade in Feet	$U_w \leq 0.060$			$0.061 < U_w \leq 0.090$			$0.091 < U_w \leq 0.110$			$0.111 < U_w \leq 0.150$			$0.151 < U_w \leq 0.190$			$0.191 < U_w \leq 0.220$		
		to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth
Less than 50	1	8	1	-8	2	-4	-12	-3	-8	-15	-10	-14	-20	-16	-19	-24	-21	-23	-28
	2	7	2	-8	0	-4	-13	-6	-10	-17	-16	-18	-24	-23	-25	-31	-28	-31	-35
	3	6	3	-7	-2	-5	-13	-9	-11	-18	-20	-22	-28	-30	-31	-36	-36	-38	-42
	4	5	5	-5	-4	-4	-12	-12	-12	-19	-25	-25	-31	-36	-36	-41	-44	-44	-48
50 - 99	1	12	2	-13	3	-5	-18	-4	-11	-22	-16	-21	-30	-24	-29	-37	-31	-35	-42
	2	10	2	-12	0	-7	-19	-9	-14	-26	-23	-28	-37	-34	-38	-46	-43	-46	-53
	3	8	4	-10	-4	-7	-20	-14	-17	-28	-31	-33	-42	-44	-46	-54	-55	-56	-63
	4	7	7	-8	-6	-6	-19	-17	-17	-29	-37	-37	-46	-54	-54	-61	-66	-66	-72
100 - 149	1	20	3	-21	5	-9	-30	-7	-19	-37	-26	-35	-50	-41	-48	-61	-52	-58	-69
	2	17	4	-20	0	-11	-32	-15	-24	-43	-39	-46	-61	-57	-63	-76	-71	-76	-88
	3	14	7	-17	-6	-12	-33	-23	-28	-46	-51	-55	-70	-74	-77	-90	-91	-94	-105
	4	12	12	-13	-10	-10	-31	-29	-29	-48	-62	-62	-77	-90	-90	-102	-110	-110	-120
150 - 199	1	28	4	-29	7	-13	-42	-10	-27	-52	-36	-49	-70	-57	-67	-85	-72	-81	-97
	2	24	6	-28	0	-15	-45	-21	-34	-60	-55	-64	-85	-80	-89	-107	-99	-107	-123
	3	20	10	-24	-8	-17	-46	-32	-39	-64	-71	-77	-98	-103	-108	-126	-127	-131	-147
	4	17	17	-18	-14	-14	-43	-41	-41	-67	-87	-87	-108	-125	-125	-142	-154	-154	-168
200 - 249	1	36	5	-38	9	-16	-54	-13	-34	-67	-47	-63	-90	-73	-86	-110	-93	-104	-125
	2	31	7	-36	0	-20	-58	-27	-43	-77	-70	-83	-110	-103	-114	-138	-128	-138	-158
	3	25	13	-31	-11	-22	-59	-41	-50	-83	-92	-99	-126	-133	-139	-162	-164	-169	-190
	4	22	22	-23	-18	-18	-56	-52	-52	-86	-112	-112	-139	-161	-161	-183	-199	-199	-216
250 - 299	1	44	7	-46	11	-20	-66	-15	-42	-81	-57	-77	-110	-89	-106	-134	-113	-127	-152
	2	37	9	-44	0	-24	-70	-33	-53	-95	-86	-101	-134	-126	-139	-168	-156	-168	-193
	3	31	15	-37	-13	-26	-73	-51	-62	-101	-112	-121	-154	-162	-170	-198	-200	-206	-232
	4	26	26	-29	-22	-22	-68	-64	-64	-106	-136	-136	-169	-197	-197	-224	-243	-243	-264
300 - 350	1	52	8	-55	13	-23	-78	-18	-49	-96	-68	-91	-130	-106	-125	-159	-134	-150	-180
	2	44	10	-52	0	-29	-83	-39	-62	-112	-101	-120	-159	-149	-165	-199	-184	-199	-229
	3	36	18	-44	-16	-31	-86	-60	-73	-120	-133	-143	-182	-192	-201	-235	-236	-244	-274
	4	31	31	-34	-26	-26	-81	-75	-75	-125	-161	-161	-200	-233	-233	-264	-287	-287	-287

Table 6-8	Thermal Ratings Slab Insulation: All Degree Days, One or Two Dwelling Units				
	Slab Perimeter (Length in feet)	R-Value of Insulation			
		R-15.0 or More	R-12.5 to R-14.9	R-10.0 to R-12.4	R-7.5 to R-9.9
50 - 100	3	2	0	-2	-6
101 - 150	5	3	0	-4	-9
151 - 200	7	4	0	-6	-13
201 - 250	9	5	0	-7	-17
251 - 300	11	6	0	-9	-21
301 - 350	13	7	0	-10	-24
351 - 400	15	8	0	-12	-28
401 - 450	17	9	0	-14	-32
451 - 500	19	10	0	-15	-36
501 - 550	22	12	0	-17	-39
551 - 600	24	13	0	-18	-43
601 - 650	26	14	0	-20	-47
651 - 700	28	15	0	-22	-51
701 - 750	30	16	0	-23	-54
751 - 800	32	17	0	-25	-58
801 - 900	35	19	0	-27	-64
901 - 1000	39	21	0	-30	-71
1001 - 1100	43	23	0	-34	-79
1101 - 1200	47	25	0	-37	-86
1201 - 1300	51	28	0	-40	-94
1301 - 1400	55	30	0	-43	-101
1401 - 1500	59	32	0	-46	-109
1501 - 1600	64	34	0	-50	-116
1601 - 1700	68	36	0	-53	-124
1701 - 1800	72	39	0	-56	-131

Table 6-1E		Thermal Ratings Net Walls, Glazing or Doors: All Degree Days, One or Two Dwelling Units																								
Net Component Area	U-Value of Component																									
	< .026	.026 to .033	.034 to .040	.041 to .050	.051 to .059	.060 to .071	.072 to .090	.091 to .100	.101 to .110	.111 to .120	.121 to .130	.131 to .140	.141 to .150	.151 to .160	.161 to .170	.171 to .190	.191 to .236	.237 to .262	.263 to .294	.295 to .335	.336 to .390	.391 to .467	.486 to .582	.583 to .770	> .770	
1-50	2	2	2	2	1	1	1	0	0	0	-1	-1	-1	-1	-2	-2	-3	-4	-5	-6	-7	-9	-12	-17	-25	
51-100	6	6	5	5	4	3	2	1	0	-1	-2	-2	-3	-4	-5	-6	-9	-11	-14	-17	-21	-27	-36	-50	-75	
101-150	11	10	9	8	6	5	3	1	0	-1	-3	-4	-5	-6	-8	-10	-16	-19	-23	-28	-35	-45	-59	-83	-124	
151-200	15	13	12	11	9	7	4	2	0	-2	-4	-5	-7	-9	-11	-14	-22	-27	-32	-40	-49	-63	-83	-116	-174	
201-250	19	17	16	14	12	9	5	2	0	-2	-5	-7	-9	-11	-14	-18	-28	-34	-41	-51	-63	-81	-106	-149	-223	
251-350	26	23	21	18	15	12	6	3	0	-3	-6	-9	-12	-15	-18	-24	-38	-46	-55	-68	-84	-107	-142	-198	-297	
351-450	34	31	28	24	20	15	8	4	0	-4	-8	-12	-16	-20	-24	-32	-50	-61	-74	-90	-112	-143	-189	-264	-396	
451-550	43	38	35	30	26	19	10	5	0	-5	-10	-15	-20	-25	-30	-40	-63	-76	-92	-113	-140	-179	-236	-331	-495	
551-650	51	46	42	36	31	23	12	6	0	-6	-12	-18	-24	-30	-36	-48	-75	-91	-110	-135	-168	-215	-283	-397		
651-750	60	54	49	42	36	27	14	7	0	-7	-14	-21	-28	-35	-42	-56	-88	-106	-129	-158	-196	-250	-330	-463		
751-900	70	63	58	50	42	32	17	8	0	-8	-17	-25	-33	-41	-50	-66	-104	-125	-152	-186	-232	-295	-389			
901-1050	83	75	68	59	50	38	20	10	0	-10	-20	-29	-39	-49	-59	-78	-122	-148	-179	-220	-274	-349	-460			
1051-1200	96	86	79	68	58	43	23	11	0	-11	-23	-34	-45	-56	-68	-90	-141	-171	-207	-254	-316	-402				
1201-1350	108	98	89	77	65	49	26	13	0	-13	-26	-38	-51	-64	-77	-102	-160	-193	-235	-287	-358	-456				
1351-1500	121	109	100	86	73	55	29	14	0	-14	-29	-43	-57	-71	-86	-114	-179	-216	-262	-321	-400					
1501-1700	136	123	112	96	82	62	32	16	0	-16	-32	-48	-64	-80	-96	-128	-201	-242	-294	-361	-449					
1701-1900	153	138	126	108	92	69	36	18	0	-18	-36	-54	-72	-90	-108	-144	-226	-273	-331	-406						
1901-2100	170	153	140	120	102	77	40	20	0	-20	-40	-60	-80	-100	-120	-160	-251	-303	-368	-451						
2101-2300	187	169	154	132	113	85	44	22	0	-22	-44	-66	-88	-110	-132	-176	-276	-333	-405	-496						
2301-2500	204	184	168	144	123	93	48	24	0	-24	-48	-72	-96	-120	-144	-192	-301	-364	-441							
2501-2750	223	201	184	158	134	101	53	26	0	-26	-53	-79	-105	-131	-158	-210	-330	-398	-483							
2751-3000	244	220	201	173	147	111	58	29	0	-29	-58	-86	-115	-144	-173	-230	-361	-436								
3001-3250	266	240	219	188	160	121	63	31	0	-31	-63	-94	-125	-156	-188	-250	-392	-474								
3250-3500	287	259	236	203	173	130	68	34	0	-34	-68	-101	-135	-169	-203	-270	-424									
3501-3750	308	278	254	218	186	140	73	36	0	-36	-73	-109	-145	-181	-218	-290	-455									

**Not Permitted**

**Table 6-2E Thermal Ratings Roof/Ceiling and Skylight Glazing: 5000 - 6000 Degree Days, Floors: 7000 - 9000 Degree Days One or Two Dwelling Units**

Net Component Area	U-Value of Component																								
	< .023	.023 to .025	.026 to .030	.031 to .035	.036 to .040	.041 to .045	.046 to .050	.051 to .055	.056 to .060	.061 to .065	.066 to .070	.071 to .090	.091 to .110	.111 to .135	.136 to .175	.176 to .200	.201 to .236	.237 to .262	.263 to .294	.295 to .335	.336 to .390	.391 to .467	.468 to .582	.583 to .770	> .770
1 -50	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-2	-2	-3	-4	-5	-6	-6	-8	-9	-11	-14	-19	-27
51 -100	1	1	1	0	0	0	-1	-1	-2	-2	-2	-4	-5	-7	-10	-12	-15	-17	-19	-22	-26	-32	-41	-55	-80
101 -150	2	2	1	1	0	-1	-1	-2	-3	-3	-4	-6	-9	-12	-17	-20	-25	-28	-32	-37	-44	-54	-68	-92	-133
151 -200	3	3	2	1	0	-1	-2	-3	-4	-4	-5	-9	-12	-17	-24	-28	-34	-39	-45	-52	-62	-75	-95	-128	-186
201 -250	4	3	2	1	0	-1	-2	-3	-5	-6	-7	-11	-16	-21	-30	-36	-44	-50	-57	-67	-79	-96	-122	-165	-239
251 -350	5	5	3	2	0	-2	-3	-5	-6	-8	-9	-15	-21	-29	-41	-48	-59	-67	-76	-89	-105	-128	-163	-219	-319
351 -450	7	6	4	2	0	-2	-4	-6	-8	-10	-12	-20	-28	-38	-54	-64	-78	-89	-102	-118	-140	-171	-217	-293	-425
451 -550	9	8	5	3	0	-3	-5	-8	-10	-13	-15	-25	-35	-48	-68	-80	-98	-111	-127	-148	-175	-214	-271	366	
551 -650	11	9	6	3	0	-3	-6	-9	-12	-15	-18	-30	-42	-57	-81	-96	-117	-133	-152	-177	-210	-257	-325	-439	
651 -750	13	11	7	4	0	-4	-7	-11	-14	-18	-21	-35	-49	-67	-95	-112	-137	-155	-178	-207	-246	-299	-379		
751 -900	15	12	8	-4	0	-4	-8	-12	-17	-21	-25	-41	-58	-78	-111	-132	-161	-183	-210	-244	-289	-353	-447		
901 -1050	18	15	10	5	0	-5	-10	-15	-20	-24	-29	-49	-68	-93	-132	-156	-191	-216	-248	-288	-342	-417			
1051 -1200	20	17	11	6	0	-6	-11	-17	-23	-28	-34	-56	-79	-107	-152	-180	-220	-249	-286	-332	-394	-481			
1201 -1350	23	19	13	6	0	-6	-13	-19	-26	-32	-38	-64	-89	-121	-172	-204	-249	-283	-324	-377	-447				
1351 -1500	26	21	14	7	0	-7	-14	-21	-29	-36	-43	-71	-100	-135	-192	-228	-279	-316	-362	-421	-500				
1501 -1700	29	24	16	8	0	-8	-16	-24	-32	-40	-48	-80	-112	-152	-216	-256	-313	-355	-406	-473					
1701 -1900	32	27	18	9	0	-9	-18	-27	-36	-45	-54	-90	-126	-171	-243	-288	-352	-399	-457						
1901 -2100	36	30	20	10	0	-10	-20	-30	-40	-50	-60	-100	-140	-190	-270	-320	-391	-443							
2101 -2300	40	33	22	11	0	-11	-22	-33	-44	-55	-66	-110	-154	-209	-297	-352	-430	-487							
2301 -2500	43	36	24	12	0	-12	-24	-36	-48	-60	-72	-120	-168	-228	-324	-384	-469								
2501 -2750	47	39	26	13	0	-13	-26	-39	-53	-66	-79	-131	-184	-249	-354	-420									
2751 -3000	52	43	29	14	0	-14	-29	-43	-58	-72	-86	-144	-201	-273	-388	-460									
3001 -3250	56	47	31	16	0	-16	-31	-47	-63	-78	-94	-156	-219	-297	-422										
3250 -3500	61	51	34	17	0	-17	-34	-51	-68	-84	-101	-169	-236	-321	-456										
3501 -3750	65	54	36	18	0	-18	-36	-54	-73	-91	-109	-181	-254	-344	-489										

**Not Permitted**

**Table 6-3E Thermal Ratings Roof/Ceiling and Skylight Glazing: 7000 - 9000 Degree Days, Floors: 7000 - 9000 Degree Days One or Two Dwelling Units**

Net Component Area	U-Value of Component																								
	< .023	.023 to .025	.026 to .030	.031 to .035	.036 to .040	.041 to .045	.046 to .050	.051 to .055	.056 to .060	.061 to .065	.066 to .070	.071 to .090	.091 to .110	.111 to .135	.136 to .175	.176 to .200	.201 to .236	.237 to .262	.263 to .294	.295 to .335	.336 to .390	.391 to .467	.468 to .582	.583 to .770	> .770
1 -50	0	0	0	0	0	0	-1	-1	-1	-1	-1	-2	-2	-3	-4	-4	-5	-6	-7	-8	-9	-11	-14	-19	-27
51 -100	1	0	0	0	-1	-1	-2	-2	-2	-3	-3	-5	-6	-8	-11	-13	-16	-17	-20	-23	-27	-33	-42	-56	-81
101 -150	1	1	0	-1	-1	-2	-3	-3	-4	-4	-5	-8	-10	-13	-18	-21	-26	-29	-33	-38	-45	-55	-69	-93	-134
151 -200	1	1	0	-1	-2	-3	-4	-4	-5	-6	-7	-11	-14	-18	-25	-30	-36	-41	-46	-54	-63	-77	-97	-130	-188
201 -250	2	1	0	-1	-2	-3	-5	-6	-7	-8	-9	-14	-18	-24	-33	-38	-46	-52	-60	-69	-81	-99	-124	-167	-241
251 -350	2	2	0	-2	-3	-5	-6	-8	-9	-11	-12	-18	-24	-32	-44	-51	-62	-70	-79	-92	-108	-131	-166	-222	-322
351 -450	3	2	0	-2	-4	-6	-8	-10	-12	-14	-16	-24	-32	-42	-58	-68	-82	-93	-106	-122	-144	-175	-221	-297	-429
451 -550	4	3	0	-3	-5	-8	-10	-13	-15	-18	-20	-30	-40	-53	-73	-85	-103	-116	-132	-153	-180	-219	-276	-371	
551 -650	5	3	0	-3	-6	-9	-12	-15	-18	-21	-24	-36	-48	-63	-87	-102	-123	-139	-158	-183	-216	-263	-331	-445	
651 -750	6	4	0	-4	-7	-11	-14	-18	-21	-25	-28	-42	-56	-74	-102	-119	-144	-162	-185	-214	-253	-306	-386		
751 -900	7	4	0	-4	-8	-12	-17	-21	-25	-29	-33	-50	-66	-87	-120	-140	-170	-191	-218	-252	-298	-361	-455		
901 -1050	8	5	0	-5	-10	-15	-20	-24	-29	-34	-39	-59	-78	-102	-141	-166	-201	-226	-257	-298	-352	-427			
1051 -1200	9	6	0	-6	-11	-17	-23	-28	-34	-39	-45	-68	-90	-118	-163	-191	-231	-261	-297	-344	-406	-492			
1201 -1350	10	6	0	-6	-13	-19	-26	-32	-38	-45	-51	-77	-102	-134	-185	-217	-262	-295	-337	-389	-460				
1351 -1500	11	7	0	-7	-14	-21	-29	-36	-43	-50	-57	-86	-114	-150	-207	-242	-293	-330	-376	-435					
1501 -1700	13	8	0	-8	-16	-24	-32	-40	-48	-56	-64	-96	-128	-168	-232	-272	-329	-371	-422	-489					
1701 -1900	14	9	0	-9	-18	-27	-36	-45	-54	-63	-72	-108	-144	-189	-261	-306	-370	-417	-475						
1901 -2100	16	10	0	-10	-20	-30	-40	-50	-60	-70	-80	-120	-160	-210	-290	-340	-411	-463							
2101 -2300	18	11	0	-11	-22	-33	-44	-55	-66	-77	-88	-132	-176	-231	-319	-374	-452								
2301 -2500	19	12	0	-12	-24	-36	-48	-60	-72	-84	-96	-144	-192	-252	-348	-408	-493								
2501 -2750	21	13	0	-13	-26	-39	-53	-66	-79	-92	-105	-158	-210	-276	-381	-446									
2751 -3000	23	14	0	-14	-29	-43	-58	-72	-86	-101	-115	-173	-230	-302	-417	-489									
3001 -3250	25	16	0	-16	-31	-47	-63	-78	-94	-109	-125	-188	-250	-328	-453										
3250 -3500	27	17	0	-17	-34	-51	-68	-84	-101	-118	-135	-203	-270	-354	-489										
3501 -3750	29	18	0	-18	-36	-54	-73	-91	-109	-127	-145	-218	-290	-381											

**Not Permitted**

**Table 6-4E Thermal Ratings Roof/Ceiling and Skylight Glazing: 7000 - 9000 Degree Days, Floors: 7000 - 9000 Degree Days One or Two Dwelling Units**

Net Component Area	U-Value of Component																								
	< .023	.023 to .025	.026 to .030	.031 to .035	.036 to .040	.041 to .045	.046 to .050	.051 to .055	.056 to .060	.061 to .065	.066 to .070	.071 to .090	.091 to .110	.111 to .135	.136 to .175	.176 to .200	.201 to .236	.237 to .262	.263 to .294	.295 to .335	.336 to .390	.391 to .467	.468 to .582	.583 to .770	> .770
1 -50	1	1	1	0	0	0	0	0	0	0	-1	-1	-2	-2	-3	-4	-5	-5	-6	-7	-9	-11	-14	-18	-27
51 -100	2	2	2	1	1	0	0	0	-1	-1	-2	-3	-5	-6	-9	-11	-14	-16	-18	-22	-26	-32	-40	-54	-79
101 -150	4	3	3	2	1	1	0	-1	-1	-2	-3	-5	-8	-11	-16	-19	-23	-27	-31	-36	-43	-52	-67	-90	-132
151 -200	5	4	4	3	2	1	0	-1	-2	-3	-4	-7	-11	-15	-22	-26	-33	-37	-43	-50	-60	-73	-93	-126	-184
201 -250	6	6	5	3	2	1	0	-1	-2	-3	-5	-9	-14	-19	-28	-34	-42	-48	-55	-64	-77	-94	-120	-162	-237
251 -350	8	8	6	5	3	2	0	-2	-3	-5	-6	-12	-18	-26	-38	-45	-56	-64	-73	-86	-102	-125	-160	-216	-316
351 -450	11	10	8	6	4	2	0	-2	-4	-6	-8	-16	-24	-34	-50	-60	-74	-85	-98	-114	-136	-167	-213	-289	-421
451 -550	14	13	10	8	5	3	0	-3	-5	-8	-10	-20	-30	-43	-63	-75	-93	-106	-122	-143	-170	-209	-266	-361	
551 -650	17	15	12	9	6	3	0	-3	-6	-9	-12	-24	-36	-51	-75	-90	-111	-127	-146	-171	-204	-251	-319	-433	
651 -750	20	18	14	11	7	4	0	-4	-7	-11	-14	-28	-42	-60	-88	-105	-130	-148	-171	-200	-239	-292	-372		
751 -900	23	21	17	12	8	4	0	-4	-8	-12	-17	-33	-50	-70	-103	-124	-153	-175	-201	-236	-281	-344	-439		
901 -1050	27	24	20	15	10	5	0	-5	-10	-15	-20	-39	-59	-83	-122	-146	-181	-206	-238	-278	-332	-407			
1051 -1200	32	28	23	17	11	6	0	-6	-11	-17	-23	-45	-68	-96	-141	-169	-209	-238	-274	-321	-383	-470			
1201 -1350	36	32	26	19	13	6	0	-6	-13	-19	-26	-51	-77	-108	-159	-191	-237	-270	-311	-364	-434				
1351 -1500	40	36	29	21	14	7	0	-7	-14	-21	-29	-57	-86	-121	-178	-214	-265	-302	-348	-407	-485				
1501 -1700	45	40	32	24	16	8	0	-8	-16	-24	-32	-64	-96	-136	-200	-240	-297	-339	-390	-457					
1701 -1900	50	45	36	27	18	9	0	-9	-18	-27	-36	-72	-108	-153	-225	-270	-334	-381	-439						
1901 -2100	56	50	40	30	20	10	0	-10	-20	-30	-40	-80	-120	-170	-250	-300	-371	-423	-488						
2101 -2300	62	55	44	33	22	11	0	-11	-22	-33	-44	-88	-132	-187	-275	-330	-408	-465							
2301 -2500	67	60	48	36	24	12	0	-12	-24	-36	-48	-96	-144	-204	-300	-360	-445								
2501 -2750	74	66	53	39	26	13	0	-13	-26	-39	-53	-105	-158	-223	-328	-394	-487								
2751 -3000	81	72	58	43	29	14	0	-14	-29	-43	-58	-115	-173	-244	-359	-431									
3001 -3250	88	78	63	47	31	16	0	-16	-31	-47	-63	-125	-188	-266	-391	-469									
3250 -3500	95	84	68	51	34	17	0	-17	-34	-51	-68	-135	-203	-287	-422										
3501 -3750	102	91	73	54	36	18	0	-18	-36	-54	-73	-145	-218	-308	-453										

**Not Permitted**

<b>Table 6-5E Thermal Ratings Foundation Walls: All Degree Days, One or Two Dwelling Units</b>																			
Foundation Wall Perimeter in Linear Feet	Exposure Above Grade in Feet	$U_w \leq 0.060$			$0.061 < U_w \leq 0.090$			$0.091 < U_w \leq 0.110$			$0.111 < U_w \leq 0.150$			$0.151 < U_w \leq 0.190$			$0.191 < U_w \leq 0.220$		
		to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth
Less than 50	1	8	1	-8	2	-4	-12	-3	-8	-15	-10	-14	-20	-16	-19	-24	-21	-23	-28
	2	7	2	-8	0	-4	-13	-6	-10	-17	-16	-18	-24	-23	-25	-31	-28	-31	-35
	3	6	3	-7	-2	-5	-13	-9	-11	-18	-20	-22	-28	-30	-31	-36	-36	-38	-42
	4	5	5	-5	-4	-4	-12	-12	-12	-19	-25	-25	-31	-36	-36	-41	-44	-44	-48
50 - 99	1	12	2	-13	3	-5	-18	-4	-11	-22	-16	-21	-30	-24	-29	-37	-31	-35	-42
	2	10	2	-12	0	-7	-19	-9	-14	-26	-23	-28	-37	-34	-38	-46	-43	-46	-53
	3	8	4	-10	-4	-7	-20	-14	-17	-28	-31	-33	-42	-44	-46	-54	-55	-56	-63
	4	7	7	-8	-6	-6	-19	-17	-17	-29	-37	-37	-46	-54	-54	-61	-66	-66	-72
100 - 149	1	20	3	-21	5	-9	-30	-7	-19	-37	-26	-35	-50	-41	-48	-61	-52	-58	-69
	2	17	4	-20	0	-11	-32	-15	-24	-43	-39	-46	-61	-57	-63	-76	-71	-76	-88
	3	14	7	-17	-6	-12	-33	-23	-28	-46	-51	-55	-70	-74	-77	-90	-91	-94	-105
	4	12	12	-13	-10	-10	-31	-29	-29	-48	-62	-62	-77	-90	-90	-102	-110	-110	-120
150 - 199	1	28	4	-29	7	-13	-42	-10	-27	-52	-36	-49	-70	-57	-67	-85	-72	-81	-97
	2	24	6	-28	0	-15	-45	-21	-34	-60	-55	-64	-85	-80	-89	-107	-99	-107	-123
	3	20	10	-24	-8	-17	-46	-32	-39	-64	-71	-77	-98	-103	-108	-126	-127	-131	-147
	4	17	17	-18	-14	-14	-43	-41	-41	-67	-87	-87	-108	-125	-125	-142	-154	-154	-168
200 - 249	1	36	5	-38	9	-16	-54	-13	-34	-67	-47	-63	-90	-73	-86	-110	-93	-104	-125
	2	31	7	-36	0	-20	-58	-27	-43	-77	-70	-83	-110	-103	-114	-138	-128	-138	-158
	3	25	13	-31	-11	-22	-59	-41	-50	-83	-92	-99	-126	-133	-139	-162	-164	-169	-190
	4	22	22	-23	-18	-18	-56	-52	-52	-86	-112	-112	-139	-125	-161	-183	-199	-199	-216
250 - 299	1	44	7	-46	11	-20	-66	-15	-42	-81	-57	-77	-110	-89	-106	-134	-113	-127	-152
	2	37	9	-44	0	-24	-70	-33	-53	-95	-86	-101	-134	-126	-139	-168	-156	-168	-193
	3	31	15	-37	-13	-26	-73	-51	-62	-101	-112	-121	-154	-162	-170	-198	-200	-206	-232
	4	26	26	-29	-22	-22	-68	-64	-64	-106	-136	-136	-169	-197	-197	-224	-243	-243	-264
300 - 350	1	52	8	-55	13	-23	-78	-18	-49	-96	-68	-91	-130	-106	-125	-159	-134	-150	-180
	2	44	10	-52	0	-29	-83	-39	-62	-112	-101	-120	-159	-149	-165	-199	-184	-199	-229
	3	36	18	-44	-16	-31	-86	-60	-73	-120	-133	-143	-182	-192	-201	-235	-236	-244	-274
	4	31	31	-34	-26	-26	-81	-75	-75	-125	-161	-161	-200	-233	-233	-264	-287	-287	-287

<b>Table 6-6E</b>	<b>Thermal Ratings Slab Insulation: All Degree Days, One or Two Dwelling Units</b>				
Slab Perimeter (Length in feet)	R-Value of Insulation				
	R-15.0 or More	R-12.5 to R-14.9	R-10.0 to R-12.4	R-7.5 to R-9.9	R-5.0 to R-7.4
50 - 100	3	2	0	-2	-6
101 - 150	5	3	0	-4	-9
151 - 200	7	4	0	-6	-13
201 - 250	9	5	0	-7	-17
251 - 300	11	6	0	-9	-21
301 - 350	13	7	0	-10	-24
351 - 400	15	8	0	-12	-28
401 - 450	17	9	0	-14	-32
451 - 500	19	10	0	-15	-36
501 - 550	22	12	0	-17	-39
551 - 600	24	13	0	-18	-43
601 - 650	26	14	0	-20	-47
651 - 700	28	15	0	-22	-51
701 - 750	30	16	0	-23	-54
751 - 800	32	17	0	-25	-58
801 - 900	35	19	0	-27	-64
901 - 1000	39	21	0	-30	-71
1001 - 1100	43	23	0	-34	-79
1101 - 1200	47	25	0	-37	-86
1201 - 1300	51	28	0	-40	-94
1301 - 1400	55	30	0	-43	-101
1401 - 1500	59	32	0	-46	-109
1501 - 1600	64	34	0	-50	-116
1601 - 1700	68	36	0	-53	-124
1701 - 1800	72	39	0	-56	-131

<b>Chart 6M-A</b>	<b>Thermal Rating Tables for All Residential Buildings Containing Three or More Dwelling Units Three Stories or Less in Height w/ Non-electric Comfort Heating</b>				
<b>Envelope Component</b>	<b>Degree Days</b>				
	5000	6000	7000	8000	9000
Net Walls	Table 6M-1	Table 6M-1	Table 6M-2	Table 6M-2	Table 6M-2
Glazing	Table 6M-1	Table 6M-1	Table 6M-2	Table 6M-2	Table 6M-2
Doors	Table 6M1	Table 6M-1	Table 6M-2	Table 6M-2	Table 6M-2
Roof/Ceiling, Skylight Glazing	Table 6M-3	Table 6M-3	Table 6M-4	Table 6M-4	Table 6M-4
Floors	Table 6M-3	Table 6M-3	Table 6M-3	Table 6M-3	Table 6M-3
Foundation Walls	Table 6M-5	Table 6M-5	Table 6M-6	Table 6M-6	Table 6M-7
Slab Insulation	Table 6M-8	Table 6M-8	Table 6M-8	Table 6M-8	Table 6M-8

<b>Chart 6M-B</b>	<b>Thermal Rating Tables for All Residential Buildings Containing Three or More Dwelling Units Three Stories or Less in Height w/ Electric Comfort Heating</b>				
<b>Envelope Component</b>	<b>Degree Days</b>				
	5000	6000	7000	8000	9000
Net Walls	Table 6M-1E	Table 6M-1E	Table 6M-2E	Table 6M-2E	Table 6M-2E
Glazing	Table 6M-1E	Table 6M-1E	Table 6M-2E	Table 6M-2E	Table 6M-2E
Doors	Table 6M-1E	Table 6M-1E	Table 6M-2E	Table 6M-2E	Table 6M-2E
Roof/Ceiling, Skylight Glazing	Table 6M-3E	Table 6M-3E	Table 6M-4E	Table 6M-4E	Table 6M-4E
Floors	Table 6M-3E	Table 6M-5E	Table 6M-3E	Table 6M-3E	Table 6M-3E
Foundation Walls	Table 6M-5E	Table 6M-6E	Table 6M-6E	Table 6M-6E	Table 6M-6E
Slab Insulation	Table 6M-7E	Table 6M-7E	Table 6M-7E	Table 6M-7E	Table 6M-7E

Table 6M-1		Thermal Ratings Net Walls, Glazing or Doors: 5000 - 6000 Degree Days, Three or More Dwelling Units/Three Stories or Less																								
Net Component Area	U-Value of Component																									
	< .026	.026 to .033	.034 to .040	.041 to .050	.051 to .059	.060 to .071	.072 to .090	.091 to .100	.111 to .120	.121 to .130	.131 to .140	.141 to .150	.151 to .160	.161 to .170	.171 to .190	.191 to .236	.211 to .220	.221 to .230	.231 to .280	.281 to .300	.301 to .390	.391 to .450	.451 to .582	.583 to .770	> .770	
1 - 50	5	5	5	4	4	4	3	3	3	2	2	2	2	1	1	0	0	0	-2	-2	-4	-6	-9	-14	-22	
51 - 100	15	14	14	13	12	11	10	8	8	7	6	5	5	4	2	1	0	-1	-5	-6	-13	-17	-27	-42	-66	
101 - 150	24	23	23	21	20	19	16	14	13	11	10	9	8	6	4	1	0	-1	-8	-10	-21	-29	-45	-69	-110	
151 - 200	34	33	32	30	28	26	23	19	18	16	14	12	11	9	5	2	0	-2	-11	-14	-30	-40	-63	-97	-154	
201 - 250	44	42	41	38	36	34	29	25	23	20	18	16	14	11	7	2	0	-2	-14	-18	-38	-52	-82	-124	-198	
251 - 400	63	61	59	55	52	48	42	36	33	29	26	23	20	16	10	3	0	-3	-20	-26	-55	-75	-118	-179	-286	
401 - 550	93	89	86	81	77	71	62	52	48	43	38	33	29	24	14	5	0	-5	-29	-38	-81	-109	-172	-262	-418	
551 - 700	122	117	113	106	101	93	81	69	63	56	50	44	38	31	19	6	0	-6	-38	-50	-106	-144	-226	-344	<b>Not Permitted</b>	
701 - 850	151	145	140	132	125	115	101	85	78	70	62	54	47	39	23	8	0	-8	-47	-62	-132	-178	-281	-427		
851 - 1000	180	173	167	157	149	138	120	102	93	83	74	65	56	46	28	9	0	-9	-56	-74	-157	-213	-335	-509		
1001 - 1250	219	210	203	191	181	167	146	124	113	101	90	79	68	56	34	11	0	-11	-68	-90	-191	-259	-407	-619		
1251 - 1500	268	257	248	234	222	204	179	151	138	124	110	96	83	69	41	14	0	-14	-83	-110	-234	-316	-498	-757		
1501 - 1750	317	303	293	276	262	242	211	179	163	146	130	114	98	81	49	16	0	-16	-98	-130	-276	-374	-588	-895		
1751 - 2000	366	350	338	319	302	279	244	206	188	169	150	131	113	94	56	19	0	-19	-113	-150	-319	-431	-678			
2001 - 2250	414	397	383	361	343	316	276	234	213	191	170	149	128	106	64	21	0	-21	128	-170	-361	-489	-769			
2251 - 2500	463	443	428	404	383	353	309	261	238	214	190	166	143	119	71	24	0	-24	-143	-190	-404	-546	-859			
2501 - 2750	512	490	473	446	423	390	341	289	263	236	210	184	158	131	79	26	0	-26	-158	-210	-446	-604	-950			
2751 - 3000	561	537	518	489	463	427	374	316	288	259	230	201	173	144	86	29	0	-29	-173	-230	-489	-661				
3001 - 3250	609	583	563	531	504	464	406	344	313	281	250	219	188	156	94	31	0	-31	-188	-250	-531	-719				
3251 - 3500	658	630	608	574	544	502	439	371	338	304	270	236	203	169	101	34	0	-34	-203	-270	-574	-776				
3501 - 3800	712	681	657	621	588	542	475	402	365	329	292	256	219	183	110	37	0	-37	-219	-292	-621	-840				
3801 - 4100	770	737	711	672	637	587	514	435	395	356	316	277	237	198	119	40	0	-40	-237	-316	-672	-909				
4101 - 4400	829	793	765	723	685	632	553	468	425	383	340	298	255	213	128	43	0	-43	-255	-340	-723	-978				
4401 - 4700	887	849	819	774	733	676	592	501	455	410	364	319	273	228	137	46	0	-46	-273	-364	-774					
4701 - 5000	946	905	873	825	782	721	631	534	485	437	388	340	291	243	146	49	0	-49	-291	-388	-825					

Table 6M-2		Thermal Ratings Net Walls, Glazing or Doors: 7000 - 9000 Degree Days, Three or More Dwelling Units/Three Stories or Less																								
Net Component Area	U-Value of Component																									
	< .026	.026 to .033	.034 to .040	.041 to .050	.051 to .059	.060 to .071	.072 to .090	.091 to .100	.111 to .120	.121 to .130	.131 to .140	.141 to .150	.151 to .160	.161 to .170	.171 to .190	.191 to .236	.211 to .220	.221 to .230	.231 to .280	.281 to .300	.301 to .390	.391 to .450	.451 to .582	.583 to .770	> .770	
1 - 50	5	5	4	4	4	4	3	3	2	2	2	2	1	1	1	0	0	-1	-2	-2	-5	-6	-9	-14	-23	
51 - 100	14	13	13	12	11	10	9	8	7	6	5	5	4	3	2	0	-1	-2	-5	-7	-14	-18	-28	-42	-67	
101 - 150	23	22	21	20	19	17	15	13	11	10	9	8	6	5	3	0	-1	-3	-9	-11	-23	-30	-47	-70	-112	
151 - 200	32	31	30	28	27	24	21	18	16	14	12	11	9	7	4	0	-2	-4	-12	-16	-32	-42	-65	-98	-156	
201 - 250	42	40	38	36	34	31	27	23	20	18	16	14	11	9	5	0	-2	-5	-16	-20	-41	-54	-84	-126	-201	
251 - 400	60	58	55	52	49	45	39	33	29	26	23	20	16	13	7	0	-3	-7	-23	-29	-59	-78	-121	-182	-290	
401 - 550	88	84	81	76	72	66	57	48	43	38	33	29	24	19	10	0	-5	-10	-33	-43	-86	-114	-177	-266	-423	
551 - 700	116	111	106	100	95	87	75	63	56	50	44	38	31	25	13	0	-6	-13	-44	-56	-113	-150	-233	-351	<b>Not Permitted</b>	
701 - 850	143	137	132	124	117	107	93	78	70	62	54	47	39	31	16	0	-8	-16	-54	-70	-140	-186	-288	-435		
851 - 1000	171	164	157	148	140	128	111	93	83	74	65	56	46	37	19	0	-9	-19	-65	-83	-167	-222	-344	-519		
1001 - 1250	208	199	191	180	170	156	135	113	101	90	79	68	56	45	23	0	-11	-23	-79	-101	-203	-270	-418	-631		
1251 - 1500	254	243	234	220	208	191	165	138	124	110	96	83	69	55	28	0	-14	-28	-96	-124	-248	-330	-511	-771		
1501 - 1750	301	287	276	260	246	225	195	163	146	130	114	98	81	65	33	0	-16	-33	-114	-146	-293	-390	-604	-911		
1751 - 2000	347	331	319	300	284	260	225	188	169	150	131	113	94	75	38	0	-19	-38	-131	-169	-338	-450	-697			
2001 - 2250	393	376	361	340	321	295	255	213	191	170	149	128	106	85	43	0	-21	-43	-149	-191	-383	-510	-790			
2251 - 2500	439	420	404	380	359	329	285	238	214	190	166	143	119	95	48	0	-24	-48	-166	-214	-428	-570	-883			
2501 - 2750	486	464	446	420	397	364	315	263	236	210	184	158	131	105	53	0	-26	-53	-184	-236	-473	-630	-976			
2751 - 3000	532	508	489	460	435	398	345	288	259	230	201	173	144	115	58	0	-29	-58	-201	-259	-518	-690				
3001 - 3250	578	552	531	500	473	433	375	313	281	250	219	188	156	125	63	0	-31	-63	-219	-281	-563	-750				
3251 - 3500	624	596	574	540	510	468	405	338	304	270	236	203	169	135	68	0	-34	-68	-236	-304	-608	-810				
3501 - 3800	675	645	621	584	552	506	438	365	329	292	256	219	183	146	73	0	-37	-73	-256	-329	-657	-876				
3801 - 4100	731	698	672	632	597	547	474	395	356	316	277	237	198	158	79	0	-40	-79	-277	-356	-711	-948				
4101 - 4400	786	751	723	680	643	589	510	425	383	340	298	255	213	170	85	0	-43	-85	-298	-383	-765					
4401 - 4700	842	804	774	728	688	631	546	455	410	364	319	273	228	182	91	0	-46	-91	-319	-410	-819					
4701 - 5000	897	857	825	776	733	672	582	485	437	388	340	291	243	194	97	0	-49	-97	-340	-437	-873					

**Table 6M-3**

**Thermal Ratings Roof/Ceiling and Skylight Glazing: 5000 - 6000 Degree Days, Floors: All Degree Days  
Three or More Dwelling Units/Three Stories or Less**

Net Component Area	U-Value of Component																								
	< .023	.023 to .025	.026 to .030	.031 to .035	.036 to .040	.041 to .045	.046 to .050	.051 to .055	.056 to .060	.061 to .065	.066 to .070	.071 to .090	.091 to .110	.111 to .135	.136 to .175	.176 to .200	.201 to .236	.237 to .262	.263 to .294	.295 to .335	.336 to .390	.391 to .467	.468 to .582	.583 to .770	> .770
1 - 50	1	1	1	0	0	0	0	0	0	0	-1	-1	-2	-2	-3	-4	-5	-5	-6	-7	-9	-11	-14	-18	-27
51 - 100	2	2	2	1	1	0	0	0	-1	-1	-2	-3	-5	-6	-9	-11	-14	-16	-18	-22	-26	-32	-40	-54	-79
101 - 150	4	3	3	2	1	1	0	-1	-1	-2	-3	-5	-8	-11	-16	-19	-23	-27	-31	-36	-43	-52	-67	-90	-132
151 - 200	5	4	4	3	2	1	0	-1	-2	-3	-4	-7	-11	-15	-22	-26	-33	-37	-43	-50	-60	-73	-93	-126	-184
201 - 250	6	6	5	3	2	1	0	-1	-2	-3	-5	-9	-14	-19	-28	-34	-42	-48	-55	-64	-77	-94	-120	-162	-237
251 - 400	9	8	7	5	3	2	0	-2	-3	-5	-7	-13	-20	-28	-41	-49	-60	-69	-79	-93	-111	-136	-173	-234	-342
401 - 550	13	12	10	7	5	2	0	-2	-5	-7	-10	-19	-29	-40	-59	-71	-88	-101	-116	-136	-162	-198	-253	-343	-499
551 - 700	18	16	13	9	6	3	0	-3	-6	-9	-13	-25	-38	-53	-78	-94	-116	-133	-153	-178	-213	-261	-333	-451	-657
701 - 850	22	19	16	12	8	4	0	-4	-8	-12	-16	-31	-47	-66	-97	-116	-144	-164	-189	-221	-264	-323	-412	-559	-814
851 - 1000	26	23	19	14	9	5	0	-5	-9	-14	-19	-37	-56	-79	-116	-139	-172	-196	-226	-264	-315	-386	-492	-667	-972
1001 - 1250	32	28	23	17	11	6	0	-6	-11	-17	-23	-45	-68	-96	-141	-169	-209	-238	-274	-321	-383	-470	-598	-811	
1251 - 1500	39	34	28	21	14	7	0	-7	-14	-21	-28	-55	-83	-117	-172	-206	-255	-291	-335	-392	-468	-574	-731	-991	
1501 - 1750	46	41	33	24	16	8	0	-8	-16	-24	-33	-65	-98	-138	-203	-244	-302	-344	-396	-464	-553	-678	-864		
1751 - 2000	53	47	38	28	19	9	0	-9	-19	-28	-38	-75	-113	-159	-234	-281	-348	-397	-457	-535	-639	-783	-997		
2001 - 2250	60	53	43	32	21	11	0	-11	-21	-32	-43	-85	-128	-181	-266	-319	-394	-450	-518	-607	-724	-887			
2251 - 2500	67	59	48	36	24	12	0	-12	-24	-36	-48	-95	-143	-202	-297	-356	-441	-502	-579	-678	-809	-991			
2501 - 2750	74	66	53	39	26	13	0	-13	-26	-39	-53	-105	-158	-223	-328	-394	-487	-555	-640	-749	-894				
2751 - 3000	81	72	58	43	29	14	0	-14	-29	-43	-58	-115	-173	-244	-359	-431	-534	-608	-701	-821	-979				
3001 - 3250	88	78	63	47	31	16	0	-16	-31	-47	-63	-125	-188	-266	-391	-469	-580	-661	-762	-892					
3251 - 3500	95	84	68	51	34	17	0	-17	-34	-51	-68	-135	-203	-287	-422	-506	-626	-714	-823	-963					
3501 - 3800	102	91	73	55	37	18	0	-18	-37	-55	-73	-146	-219	-310	-456	-548	-677	-772	-890						
3801 - 4100	111	99	79	59	40	20	0	-20	-40	-59	-79	-158	-237	-336	-494	-593	-733	-836	-963						
4101 - 4400	119	106	85	64	43	21	0	-21	-43	-64	-85	-170	-255	-361	-531	-638	-789	-899							
4401 - 4700	127	114	91	68	46	23	0	-23	-46	-68	-91	-182	-273	-387	-569	-683	-844	-962							
4701 - 5000	136	121	97	73	49	24	0	-24	-49	-73	-97	-194	-291	-412	-606	-728	-900								

**Not Permitted**

**Table 6M-4 Thermal Ratings Roof/Ceiling and Skylight Glazing: 7000 - 9000 Degree Days- Three or More Dwelling Units/Three Stories or Less**

Net Component Area	U-Value of Component																								
	< .023	.023 to .025	.026 to .030	.031 to .035	.036 to .040	.041 to .045	.046 to .050	.051 to .055	.056 to .060	.061 to .065	.066 to .070	.071 to .090	.091 to .110	.111 to .135	.136 to .175	.176 to .200	.201 to .236	.237 to .262	.263 to .294	.295 to .335	.336 to .390	.391 to .467	.468 to .582	.583 to .770	> .770
1 -50	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-2	-2	-3	-4	-5	-6	-6	-8	-9	-11	-14	-19	-27
51 - 100	1	1	1	0	0	0	-1	-1	-2	-2	-2	-4	-5	-7	-10	-12	-15	-17	-19	-22	-26	-32	-41	-55	-80
101 - 150	2	2	1	1	0	-1	-1	-2	-3	-3	-4	-6	-9	-12	-17	-20	-25	-28	-32	-37	-44	-54	-68	-92	-133
151 - 200	3	3	2	1	0	-1	-2	-3	-4	-4	-5	-9	-12	-17	-24	-28	-34	-39	-45	-52	-62	-75	-95	-128	-186
201 - 250	4	3	2	1	0	-1	-2	-3	-5	-6	-7	-11	-16	-21	-30	-36	-44	-50	-57	-67	-79	-96	-122	-165	-239
251 - 400	6	5	3	2	0	-2	-3	-5	-7	-8	-10	-16	-23	-31	-44	-52	-64	-72	-83	-96	-114	-139	-176	-238	-345
401 - 550	9	7	5	2	0	-2	-5	-7	-10	-12	-14	-24	-33	-45	-64	-76	-93	-105	-121	-140	-167	-203	-258	-347	-504
551 - 700	11	9	6	3	0	-3	-6	-9	-13	-16	-19	-31	-44	-59	-84	-100	-122	-139	-159	-185	-219	-267	-339	-457	-663
701 - 850	14	12	8	4	0	-4	-8	-12	-16	-19	-23	-39	-54	-74	-105	-124	-152	-172	-197	-229	-272	-331	-420	-566	-822
851 - 1000	17	14	9	5	0	-5	-9	-14	-19	-23	-28	-46	-65	-88	-125	-148	-181	-205	-235	-273	-324	-395	-501	-676	-981
1001 - 1250	20	17	11	6	0	-6	-11	-17	-23	-28	-34	-56	-79	-107	-152	-180	-220	-249	-286	-332	-394	-481	-610	-822	
1251 - 1500	25	21	14	7	0	-7	-14	-21	-28	-34	-41	-69	-96	-131	-186	-220	-269	-305	-349	-406	-482	-588	-745		
1501 - 1750	29	24	16	8	0	-8	-16	-24	-33	-41	-49	-81	-114	-154	-219	-260	-318	-360	-413	-480	-570	-695	-881		
1751 - 2000	34	28	19	9	0	-9	-19	-28	-38	-47	-56	-94	-131	-178	-253	-300	-367	-415	-476	-554	-657	-801			
2001 - 2250	38	32	21	11	0	-11	-21	-32	-43	-53	-64	-106	-149	-202	-287	-340	-416	-471	-540	-628	-745	-908			
2251 - 2500	43	36	24	12	0	-12	-24	-36	-48	-59	-71	-119	-166	-226	-321	-380	-465	-526	-603	-702	-833				
2501 - 2750	47	39	26	13	0	-13	-26	-39	-53	-66	-79	-131	-184	-249	-354	-420	-513	-582	-667	-775	-920				
2751 - 3000	52	43	29	14	0	-14	-29	-43	-58	-72	-86	-144	-201	-273	-388	-460	-562	-637	-730	-849					
3001 - 3250	56	47	31	16	0	-16	-31	-47	-63	-78	-94	-156	-219	-297	-422	-500	-611	-692	-793	-923					
3251 - 3500	61	51	34	17	0	-17	-34	-51	-68	-84	-101	-169	-236	-321	-456	-540	-660	-748	-857	-997					
3501 - 3800	66	55	37	18	0	-18	-37	-55	-73	-91	-110	-183	-256	-347	-493	-584	-714	-809	-927						
3801 - 4100	71	59	40	20	0	-20	-40	-59	-79	-99	-119	-198	-277	-375	-533	-632	-773	-875							
4101 - 4400	77	64	43	21	0	-21	-43	-64	-85	-106	-128	-213	-298	-404	-574	-680	-831	-942							
4401 - 4700	82	68	46	23	0	-23	-46	-68	-91	-114	-137	-228	-319	-432	-614	-728	-890								
4701 - 5000	87	73	49	24	0	-24	-49	-73	-97	-121	-146	-243	-340	-461	-655	-776	-949								

**Not Permitted**

<b>Table 6M-5 Thermal Ratings Foundation Walls: 5000 - 6000 Degree Days, One or Two Dwelling Units, Three or More Dwelling Units/Three Stories or Less</b>																			
Foundation Wall Perimeter in Linear Feet	Exposure Above Grade in Feet	$U_w \leq 0.060$			$0.061 < U_w \leq 0.090$			$0.091 < U_w \leq 0.110$			$0.111 < U_w \leq 0.150$			$0.151 < U_w \leq 0.190$			$0.191 < U_w \leq 0.220$		
		to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth
Less than 50	1	21	14	4	15	9	1	10	5	-2	2	-1	-7	-3	-6	-12	-8	-10	-15
	2	20	14	5	13	8	0	7	3	-4	-3	-6	-12	-10	-13	-18	-16	-18	-22
	3	18	16	6	10	8	0	4	2	-6	-8	-9	-15	-17	-18	-23	-24	-25	-29
	4	18	18	8	9	9	0	1	1	-6	-12	-12	-18	-23	-23	-28	-31	-31	-35
50 - 99	1	31	21	7	22	14	1	15	8	-3	4	-2	-11	-5	-10	-17	-12	-15	-22
	2	29	22	7	19	13	0	10	5	-7	-4	-8	-17	-15	-19	-27	-23	-27	-34
	3	28	23	9	16	12	-1	5	2	-8	-11	-14	-23	-25	-27	-35	-35	-37	-44
	4	26	26	11	13	13	1	2	2	-10	-18	-18	-27	-35	-35	-42	-47	-47	-53
100 - 149	1	52	35	11	37	23	2	25	13	-5	6	-3	-18	-9	-16	-29	-20	-26	-37
	2	49	36	12	32	21	0	17	8	-11	-7	-14	-29	-25	-31	-44	-39	-44	-56
	3	46	39	15	26	20	-1	9	4	-14	-19	-23	-38	-42	-45	-58	-59	-62	-73
	4	44	44	19	22	22	1	3	3	-16	-30	-30	-45	-58	-58	-70	-78	-78	-88
150 - 199	1	73	49	15	52	32	3	35	18	-7	8	-4	-25	-12	-22	-41	-27	-36	-52
	2	69	50	17	45	29	0	24	11	-15	-10	-20	-41	-35	-44	-62	-54	-62	-78
	3	64	55	21	36	28	-1	13	6	-20	-27	-32	-53	-59	-63	-81	-82	-87	-103
	4	62	62	27	31	31	1	4	4	-22	-42	-42	-63	-81	-81	-97	-110	-110	-123
200 - 249	1	94	63	20	67	41	4	45	23	-9	11	-5	-32	-15	-29	-52	-35	-46	-67
	2	88	65	22	58	38	0	31	14	-20	-13	-25	-52	-45	-57	-80	-70	-80	-101
	3	83	70	27	47	36	-2	16	7	-25	-34	-41	-68	-75	-81	-105	-106	-111	-132
	4	79	79	34	40	40	2	5	5	-29	-54	-54	-81	-104	-104	-125	-141	-141	-158
250 - 299	1	114	77	24	81	51	4	55	29	-1	13	-7	-40	-19	-35	-64	-43	-57	-82
	2	108	79	26	70	46	0	37	18	-24	-15	-31	-64	-55	-69	-98	-85	-98	-123
	3	101	86	33	57	44	-2	20	9	-31	-42	-51	-84	-92	-99	-128	-130	-136	-161
	4	97	97	42	48	48	2	7	7	-35	-66	-66	-99	-127	-127	-153	-172	-172	-194
300 - 350	1	135	91	29	96	60	5	65	34	-13	16	-8	-47	-22	-42	-75	-51	-67	-97
	2	127	94	31	83	55	0	44	21	-29	-18	-36	-75	-66	-82	-115	-101	-116	-145
	3	120	101	39	68	52	-3	23	10	-36	-49	-60	-99	-109	-118	-151	-153	-161	-191
	4	114	114	49	57	57	3	8	8	-42	-78	-78	-117	-150	-150	-181	-204	-204	-229

<b>Table 6M-6 Thermal Ratings Foundation Walls: 7000 - 8000 Degree Days, One or Two Dwelling Units, Three or More Dwelling Units/Three Stories or Less</b>																			
Foundation Wall Perimeter in Linear Feet	Exposure Above Grade in Feet	$U_w \leq 0.060$			$0.061 < U_w \leq 0.090$			$0.091 < U_w \leq 0.110$			$0.111 < U_w \leq 0.150$			$0.151 < U_w \leq 0.190$			$0.191 < U_w \leq 0.220$		
		to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth
Less than 50	1	12	6	-4	6	1	-8	2	-3	-10	-6	-10	-16	-12	-15	-20	-16	-19	-23
	2	11	6	-4	4	0	-8	-2	-5	-13	-11	-14	-20	-18	-21	-26	-24	-26	-31
	3	10	7	-2	2	0	-9	-5	-7	-14	-16	-18	-24	-25	-26	-32	-32	-33	-38
	4	9	9	-1	0	0	-8	-7	-7	-15	-20	-20	-26	-31	-31	-36	-40	-40	-44
50 - 99	1	19	8	-6	10	1	-11	2	-5	-16	-9	-14	-23	-18	-22	-30	-24	-28	-35
	2	17	9	-5	7	0	-13	-2	-8	-19	-17	-21	-30	-28	-31	-39	-36	-39	-46
	3	15	11	-4	3	-1	-13	-7	-10	-21	-24	-26	-35	-38	-40	-48	-48	-50	-57
	4	14	14	-1	1	1	-12	-11	-11	-22	-31	-31	-40	-47	-47	-54	-60	-60	-65
100 - 149	1	31	14	-10	16	2	-19	4	-8	-26	-15	-24	-39	-30	-37	-50	-41	-47	-58
	2	28	15	-9	11	0	-21	-4	-13	-32	-28	-35	-50	-46	-52	-65	-60	-65	-77
	3	25	18	-6	5	-1	-22	-12	-17	-35	-40	-44	-59	-63	-66	-79	-80	-83	-94
	4	23	23	-2	1	1	-20	-18	-18	-37	-51	-51	-66	-79	-79	-91	-99	-99	-109
150 - 199	1	43	20	-14	22	3	-27	6	-11	-36	-21	-34	-55	-41	-52	-70	-57	-65	-82
	2	39	21	-13	15	0	-29	-6	-18	-45	-39	-49	-70	-65	-73	-92	-84	-92	-108
	3	35	25	-8	7	-1	-31	-17	-24	-49	-56	-62	-83	-88	-93	-111	-112	-116	-132
	4	32	32	-3	1	1	-28	-25	-25	-52	-71	-71	-92	-110	-110	-127	-139	-139	-153
200 - 249	1	56	25	-18	29	4	-34	7	-14	-47	-27	-43	-70	-53	-67	-90	-73	-84	-105
	2	50	27	-16	20	0	-38	-7	-23	-58	-50	-63	-90	-83	-94	-118	-108	-118	-139
	3	45	32	-11	9	-2	-40	-22	-31	-63	-72	-79	-106	-113	-119	-143	-144	-149	-170
	4	41	41	-4	2	2	-36	-32	-32	-67	-92	-92	-119	-141	-141	-163	-179	-179	-196
250 - 299	1	68	31	-22	35	4	-42	9	-18	-57	-33	-53	-86	-65	-81	-110	-89	-103	-110
	2	62	33	-20	24	0	-46	-9	-29	-70	-62	-77	-110	-102	-115	-144	-132	-144	-169
	3	55	40	-13	11	-2	-48	-26	-37	-77	-88	-97	-130	-138	-146	-174	-176	-182	-208
	4	51	51	-4	2	2	-44	-40	-40	-81	-112	-112	-145	-173	-173	-199	-218	-218	-240
300 - 350	1	81	36	-26	42	5	-49	10	-21	-68	-39	-62	-101	-77	-96	-130	-105	-122	-151
	2	73	39	-23	29	0	-55	-10	-34	-83	-73	-91	-130	-120	-136	-170	-156	-170	-200
	3	65	47	-16	13	-3	-57	-31	-44	-91	-104	-114	-153	-163	-172	-206	-208	-215	-245
	4	60	60	-5	3	3	-52	-47	-47	-96	-133	-133	-172	-204	-204	-236	-258	-258	-284

<b>Table 6M-7 Thermal Ratings Foundation Walls: 7000 - 8000 Degree Days, One or Two Dwelling Units, Three or More Dwelling Units/Three Stories or Less</b>																			
Foundation Wall Perimeter in Linear Feet	Exposure Above Grade in Feet	$U_w \leq 0.060$			$0.061 < U_w \leq 0.090$			$0.091 < U_w \leq 0.110$			$0.111 < U_w \leq 0.150$			$0.151 < U_w \leq 0.190$			$0.191 < U_w \leq 0.220$		
		to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth
Less than 50	1	8	1	-8	2	-4	-12	-3	-8	-15	-10	-14	-20	-16	-19	-24	-21	-23	-28
	2	7	2	-8	0	-4	-13	-6	-10	-17	-16	-18	-24	-23	-25	-31	-28	-31	-35
	3	6	3	-7	-2	-5	-13	-9	-11	-18	-20	-22	-28	-30	-31	-36	-36	-38	-42
	4	5	5	-5	-4	-4	-12	-12	-12	-19	-25	-25	-31	-36	-36	-41	-44	-44	-48
50 - 99	1	12	2	-13	3	-5	-18	-4	-11	-22	-16	-21	-30	-24	-29	-37	-31	-35	-42
	2	10	2	-12	0	-7	-19	-9	-14	-26	-23	-28	-37	-34	-38	-46	-43	-46	-53
	3	8	4	-10	-4	-7	-20	-14	-17	-28	-31	-33	-42	-44	-46	-54	-55	-56	-63
	4	7	7	-8	-6	-6	-19	-17	-17	-29	-37	-37	-46	-54	-54	-61	-66	-66	-72
100 - 149	1	20	3	-21	5	-9	-30	-7	-19	-37	-26	-35	-50	-41	-48	-61	-52	-58	-69
	2	17	4	-20	0	-11	-32	-15	-24	-43	-39	-46	-61	-57	-63	-76	-71	-76	-88
	3	14	7	-17	-6	-12	-33	-23	-28	-46	-51	-55	-70	-74	-77	-90	-91	-94	-105
	4	12	12	-13	-10	-10	-31	-29	-29	-48	-62	-62	-77	-90	-90	-102	-110	-110	-120
150 - 199	1	28	4	-29	7	-13	-42	-10	-27	-52	-36	-49	-70	-57	-67	-85	-72	-81	-97
	2	24	6	-28	0	-15	-45	-21	-34	-60	-55	-64	-85	-80	-89	-107	-99	-107	-123
	3	20	10	-24	-8	-17	-46	-32	-39	-64	-71	-77	-98	-103	-108	-126	-127	-131	-147
	4	17	17	-18	-14	-14	-43	-41	-41	-67	-87	-87	-108	-125	-125	-142	-154	-154	-168
200 - 249	1	36	5	-38	9	-16	-54	-13	-34	-67	-47	-63	-90	-73	-86	-110	-93	-104	-125
	2	31	7	-36	0	-20	-58	-27	-43	-77	-70	-83	-110	-103	-114	-138	-128	-138	-158
	3	25	13	-31	-11	-22	-59	-41	-50	-83	-92	-99	-126	-133	-139	-162	-164	-169	-190
	4	22	22	-23	-18	-18	-56	-52	-52	-86	-112	-112	-139	-161	-161	-183	-199	-199	-216
250 - 299	1	44	7	-46	11	-20	-66	-15	-42	-81	-57	-77	-110	-89	-106	-134	-113	-127	-152
	2	37	9	-44	0	-24	-70	-33	-53	-95	-86	-101	-134	-126	-139	-168	-156	-168	-193
	3	31	15	-37	-13	-26	-73	-51	-62	-101	-112	-121	-154	-162	-170	-198	-200	-206	-232
	4	26	26	-29	-22	-22	-68	-64	-64	-106	-136	-136	-169	-197	-197	-224	-243	-243	-264
300 - 350	1	52	8	-55	13	-23	-78	-18	-49	-96	-68	-91	-130	-106	-125	-159	-134	-150	-180
	2	44	10	-52	0	-29	-83	-39	-62	-112	-101	-120	-159	-149	-165	-199	-184	-199	-229
	3	36	18	-44	-16	-31	-86	-60	-73	-120	-133	-143	-182	-192	-201	-235	-236	-244	-274
	4	31	31	-34	-26	-26	-81	-75	-75	-125	-161	-161	-200	-233	-233	-264	-287	-287	-287

Table 6M-8	Thermal Ratings Slab Insulation: All Degree Days Three or More Dwelling Units/Three Stories or Less				
Slab Perimeter (Length in feet)	R-Value of Insulation				
	R-15.0 or More	R-12.5 to R-14.9	R-10.0 to R-12.4	R-7.5 to R-9.9	R-5.0 to R-7.4
50 - 100	3	2	0	-2	-6
101 - 150	5	3	0	-4	-9
151 - 200	7	4	0	-6	-13
201 - 250	9	5	0	-7	-17
251 - 300	11	6	0	-9	-21
301 - 350	13	7	0	-10	-24
351 - 400	15	8	0	-12	-28
401 - 450	17	9	0	-14	-32
451 - 500	19	10	0	-15	-36
501 - 550	22	12	0	-17	-39
551 - 600	24	13	0	-18	-43
601 - 650	26	14	0	-20	-47
651 - 700	28	15	0	-22	-51
701 - 750	30	16	0	-23	-54
751 - 800	32	17	0	-25	-58
801 - 900	35	19	0	-27	-64
901 - 1000	39	21	0	-30	-71
1001 - 1100	43	23	0	-34	-79
1101 - 1200	47	25	0	-37	-86
1201 - 1300	51	28	0	-40	-94
1301 - 1400	55	30	0	-43	-101
1401 - 1500	59	32	0	-46	-109
1501 - 1600	64	34	0	-50	-116
1601 - 1700	68	36	0	-53	-124
1701 - 1800	72	39	0	-56	-131

Table 6M-1E		Thermal Ratings Net Walls, Glazing or Doors: 5000 - 6000 Degree Days, Three or More Dwelling Units/Three Stories or Less																							
Net Component Area	U-Value of Component																								
	< .026	.026 to .033	.034 to .040	.041 to .050	.051 to .059	.060 to .071	.072 to .090	.091 to .100	.111 to .120	.121 to .130	.131 to .140	.141 to .150	.151 to .160	.161 to .170	.171 to .190	.191 to .236	.211 to .220	.221 to .230	.231 to .280	.281 to .300	.301 to .390	.391 to .450	.451 to .582	.583 to .770	> .770
1 - 50	3	3	3	3	2	2	2	1	1	1	0	0	0	-1	-1	-2	-2	-2	-3	-4	-6	-8	-11	-16	-24
51 - 100	9	9	8	8	7	6	5	3	2	2	1	0	-1	-2	-3	-5	-5	-6	-10	-11	-18	-23	-33	-47	-72
101 - 150	16	15	14	13	11	10	8	5	4	3	1	0	-1	-3	-5	-8	-9	-10	-16	-19	-30	-38	-54	-78	-119
151 - 200	22	20	19	18	16	14	11	7	5	4	2	0	-2	-4	-7	-11	-12	-14	-23	-26	-42	-53	-76	-109	-167
201 - 250	28	26	25	23	21	18	14	9	7	5	2	0	-2	-5	-9	-14	-16	-18	-29	-34	-54	-68	-97	-140	-214
251 - 400	41	38	36	33	30	26	20	13	10	7	3	0	-3	-7	-13	-20	-23	-26	-42	-49	-78	-98	-141	-202	-309
401 - 550	59	55	52	48	43	37	29	19	14	10	5	0	-5	-10	-19	-29	-33	-38	-62	-71	-114	-143	-205	-295	-452
551 - 700	78	73	69	63	57	49	38	25	19	13	6	0	-6	-13	-25	-38	-44	-50	-81	-94	-150	-188	-270	-388	
701 - 850	97	90	85	78	71	61	47	31	23	16	8	0	-8	-16	-31	-47	-54	-62	-101	-116	-186	-233	-335	-481	
851 - 1000	116	108	102	93	84	73	56	37	28	19	9	0	-9	-19	-37	-56	-65	-74	-120	-139	-222	-278	-400	-574	
1001 - 1250	141	131	124	113	103	88	68	45	34	23	11	0	-11	-23	-45	-68	-79	-90	-146	-169	-270	-338	-486	-698	
1251 - 1500	172	160	151	138	125	108	83	55	41	28	14	0	-14	-28	-55	83	-96	-110	-179	-206	-330	-413	-594	-853	
1501 - 1750	203	190	179	163	148	128	98	65	49	33	16	0	-16	-33	-65	-98	-114	-130	-211	-244	-390	-488	-702		
1751 - 2000	234	219	206	188	171	147	113	75	56	38	19	0	-19	-38	-75	-113	-131	-150	-244	-281	-450	-563	-810		
2001 - 2250	266	248	234	213	194	167	128	85	64	43	21	0	-21	-43	-85	-128	-149	-170	-276	-319	-510	-638	-918		
2251 - 2500	297	277	261	238	217	187	143	95	71	48	24	0	-24	-48	-95	-143	-166	-190	-309	-356	-570	-713			
2501 - 2750	328	306	289	263	239	206	158	105	79	53	26	0	-26	-53	-105	-158	-184	-210	-341	-394	-630	-788			
2751 - 3000	359	335	316	288	262	226	173	115	86	58	29	0	-29	-58	-115	-173	-201	-230	-374	-431	-690	-863			
3001 - 3250	391	365	344	313	285	246	188	125	94	63	31	0	-31	-63	-125	-188	-219	-250	-406	-469	-750	-938			
3251 - 3500	422	394	371	338	308	265	203	135	101	68	34	0	-34	-68	-135	-203	-236	-270	-439	-506	-810				
3501 - 3800	456	426	402	365	333	287	219	146	110	73	37	0	-37	-73	-146	-219	-256	-292	-475	-548	-876				
3801 - 4100	494	461	435	395	360	310	237	158	119	79	40	0	-40	-79	-158	-237	-277	-316	-514	-593	-948				
4101 - 4400	531	496	468	425	388	334	255	170	128	85	43	0	-43	-85	-170	-255	-298	-340	-553	-638					
4401 - 4700	569	531	501	455	415	358	273	182	137	91	46	0	-46	-91	-182	-273	-319	-364	-592	-683					
4701 - 5000	606	566	534	485	442	381	291	194	146	97	49	0	-49	-97	-194	-291	-340	-388	-631	-728					

**Not Permitted**

Table 6M-2E		Thermal Ratings Net Walls, Glazing or Doors: 7000 - 9000 Degree Days, Three or More Dwelling Units/Three Stories or Less																								
Net Component Area	U-Value of Component																									
	< .026	.026 to .033	.034 to .040	.041 to .050	.051 to .059	.060 to .071	.072 to .090	.091 to .100	.111 to .120	.121 to .130	.131 to .140	.141 to .150	.151 to .160	.161 to .170	.171 to .190	.191 to .236	.211 to .220	.221 to .230	.231 to .280	.281 to .300	.301 to .390	.391 to .450	.451 to .582	.583 to .770	> .770	
1 - 50	3	3	3	2	2	2	1	1	1	0	0	0	-1	-1	-1	-2	-2	-2	-4	-4	-6	-8	-11	-16	-24	
51 - 100	9	8	8	7	6	5	4	2	2	1	0	-1	-2	-2	-4	-5	-6	-7	-11	-12	-19	-23	-33	-48	-72	
101 - 150	14	13	13	11	10	9	6	4	3	1	0	-1	-3	-4	-6	-9	-10	-11	-18	-20	-31	-39	-55	-79	-120	
151 - 200	20	19	18	16	14	12	9	5	4	2	0	-2	-4	-5	-9	-12	-14	-16	-25	-28	-44	-54	-78	-111	-168	
201 - 250	26	24	23	20	18	15	11	7	5	2	0	-2	-5	-7	-11	-16	-18	-20	-32	-36	-56	-70	-100	-142	-216	
251 - 400	37	35	33	29	26	22	16	10	7	3	0	-3	-7	-10	-16	-23	-26	-29	-46	-52	-81	-101	-144	-205	-312	
401 - 550	55	51	48	43	39	33	24	14	10	5	0	-5	-10	-14	-24	-33	-38	-43	-67	-76	-119	-147	-210	-300	-456	
551 - 700	72	67	63	56	51	43	31	19	13	6	0	-6	-13	-19	-31	-44	-50	-56	-88	-100	-156	-194	-276	-394		
701 - 850	89	83	78	70	63	53	39	23	16	8	0	-8	-16	-23	-39	-54	-62	-70	-109	-124	-194	-240	-343	-489		
851 - 1000	106	99	93	83	75	63	46	28	19	9	0	-9	-19	-28	-46	-65	-74	-83	-130	-148	-231	-287	-409	-583		
1001 - 1250	129	120	113	101	91	77	56	34	23	11	0	-11	-23	-34	-56	-79	-90	-101	-158	-180	-281	-349	-497	-710		
1251 - 1500	158	147	138	124	112	94	69	41	28	14	0	-14	-28	-41	-69	-96	-110	-124	-193	-220	-344	-426	-608	-867		
1501 - 1750	187	173	163	146	132	111	81	49	33	16	0	-16	-33	-49	-81	-114	-130	-146	-228	-260	-406	-504	-718			
1751 - 2000	216	200	188	169	152	129	94	56	38	19	0	-19	-38	-56	-94	-131	-150	-169	-263	-300	-469	-581	-828			
2001 - 2250	244	227	213	191	173	146	106	64	43	21	0	-21	-43	-64	-106	-149	-170	-191	-298	-340	-531	-659	-939			
2251 - 2500	273	253	238	214	193	163	119	71	48	24	0	-24	-48	-71	-119	-166	-190	-214	-333	-380	-594	-736				
2501 - 2750	302	280	263	236	213	180	131	79	53	26	0	-26	-53	-79	-131	-184	-210	-236	-368	-420	-656	-814				
2751 - 3000	331	307	288	259	233	197	144	86	58	29	0	-29	-58	-86	-144	-201	-230	-259	-403	-460	-719	-891				
3001 - 3250	359	333	313	281	254	214	156	94	63	31	0	-31	-63	-94	-156	-219	-250	-281	-438	-500	-781	-969				
3251 - 3500	388	360	338	304	274	231	169	101	68	34	0	-34	68	-101	-169	-236	-270	-304	-473	-540	-844					
3501 - 3800	420	389	365	329	296	250	183	110	73	37	0	-37	-73	-110	-183	-256	-292	-329	-511	-584	-913					
3801 - 4100	454	421	395	356	321	271	198	119	79	40	0	-40	-79	-119	-198	-277	-316	-356	-553	-632	-988					
4101 - 4400	489	453	425	383	345	291	213	128	85	43	0	-43	-85	-128	-213	-298	-340	-383	-595	-680						
4401 - 4700	523	485	455	410	369	312	228	137	91	46	0	-46	-91	-137	-228	-319	-364	-410	-637	-728						
4701 - 5000	558	517	485	437	394	333	243	146	97	49	0	-49	-97	-146	-243	-340	-388	-437	-679	-776						

**Not Permitted**

**Table 6M-3E**

**Thermal Ratings Roof/Ceiling and Skylight Glazing: 5000 - 6000 Degree Days, Floors: 7000 - 9000 Degree Days  
Three or More Dwelling Units/Three Stories or Less**

Net Component Area	U-Value of Component																								
	< .023	.023 to .025	.026 to .030	.031 to .035	.036 to .040	.041 to .045	.046 to .050	.051 to .055	.056 to .060	.061 to .065	.066 to .070	.071 to .090	.091 to .110	.111 to .135	.136 to .175	.176 to .200	.201 to .236	.237 to .262	.263 to .294	.295 to .335	.336 to .390	.391 to .467	.468 to .582	.583 to .770	> .770
1 - 50	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-2	-2	-3	-4	-5	-6	-6	-8	-9	-11	-14	-19	-27
51 - 100	1	1	1	0	0	0	-1	-1	-2	-2	-2	-4	-5	-7	-10	-12	-15	-17	-19	-22	-26	-32	-41	-55	-80
101 - 150	2	2	1	1	0	-1	-1	-2	-3	-3	-4	-6	-9	-12	-17	-20	-25	-28	-32	-37	-44	-54	-68	-92	-133
151 - 200	3	3	2	1	0	-1	-2	-3	-4	-4	-5	-9	-12	-17	-24	-28	-34	-39	-45	-52	-62	-75	-95	-128	-186
201 - 250	4	3	2	1	0	-1	-2	-3	-5	-6	-7	-11	-16	-21	-30	-36	-44	-50	-57	-67	-79	-96	-122	-165	-239
251 - 400	6	5	3	2	0	-2	-3	-5	-7	-8	-10	-16	-23	-31	-44	-52	-64	-72	-83	-96	-114	-139	-176	-238	-345
401 - 550	9	7	5	2	0	-2	-5	-7	-10	-12	-14	-24	-33	-45	-64	-76	-93	-105	-121	-140	-167	-203	-258	-347	-504
551 - 700	11	9	6	3	0	-3	-6	-9	-13	-16	-19	-31	-44	-59	-84	-100	-122	-139	-159	-185	-219	-267	-339	-457	-663
701 - 850	14	12	8	4	0	-4	-8	-12	-16	-19	-23	-39	-54	-74	-105	-124	-152	-172	-197	-229	-272	-331	-420	-566	-822
851 - 1000	17	14	9	5	0	-5	-9	-14	-19	-23	-28	-46	-65	-88	-125	-148	-181	-205	-235	-273	-324	-395	-501	-676	-981
1001 - 1250	20	17	11	6	0	-6	-11	-17	-23	-28	-34	-56	-79	-107	-152	-180	-220	-249	-286	-332	-394	-481	-610	-822	
1251 - 1500	25	21	14	7	0	-7	-14	-21	-28	-34	-41	-69	-96	-131	-186	-220	-269	-305	-349	-406	-482	-588	-745		
1501 - 1750	29	24	16	8	0	-8	-16	-24	-33	-41	-49	-81	-114	-154	-219	-260	-318	-360	-413	-480	-570	-695	-881		
1751 - 2000	34	28	19	9	0	-9	-19	-28	-38	-47	-56	-94	-131	-178	-253	-300	-367	-415	-476	-553	-657	-801			
2001 - 2250	38	32	21	11	0	-11	-21	-32	-43	-53	-64	-106	-149	-202	-287	-340	-416	-471	-540	-628	-745	-908			
2251 - 2500	43	36	24	12	0	-12	-24	-36	-48	-59	-71	-119	-166	-226	-321	-380	-465	-526	-603	-702	-833				
2501 - 2750	47	39	26	13	0	-13	-26	-39	-53	-66	-79	-131	-184	-249	-354	-420	-513	-582	-667	-775	-920				
2751 - 3000	52	43	29	14	0	-14	-29	-43	-58	-72	-86	-144	-201	-273	-388	-460	-562	-637	-730	-849					
3001 - 3250	56	47	31	16	0	-16	-31	-47	-63	-78	-94	-156	-219	-297	-422	-500	-611	-692	-793	-923					
3251 - 3500	61	51	34	17	0	-17	-34	-51	-68	-84	-101	-169	-236	-321	-456	-540	-660	-748	-857	-997					
3501 - 3800	66	55	37	18	0	-18	-37	-55	-73	-91	-110	-183	-256	-347	-493	-584	-714	-809	-927						
3801 - 4100	71	59	40	20	0	-20	-40	-59	-79	-99	-119	-198	-277	-375	-533	-632	-773	-875							
4101 - 4400	77	64	43	21	0	-21	-43	-64	-85	-106	-128	-213	-298	-404	-574	-680	-831	-942							
4401 - 4700	82	68	46	23	0	-23	-46	-68	-91	-114	-137	-228	-319	-432	-614	-728	-890								
4701 - 5000	87	73	49	24	0	-24	-49	-73	-97	-121	-146	-243	-340	-461	-655	-776	-949								

**Not Permitted**

**Table 6M-4E Thermal Ratings Roof/Ceiling and Skylight Glazing: 7000 - 9000 Degree Days Three or More Dwelling Units/Three Stories or Less**

Net Component Area	U-Value of Component																								
	< .023	.023 to .025	.026 to .030	.031 to .035	.036 to .040	.041 to .045	.046 to .050	.051 to .055	.056 to .060	.061 to .065	.066 to .070	.071 to .090	.091 to .110	.111 to .135	.136 to .175	.176 to .200	.201 to .236	.237 to .262	.263 to .294	.295 to .335	.336 to .390	.391 to .467	.468 to .582	.583 to .770	> .770
1 - 50	0	0	0	0	0	0	-1	-1	-1	-1	-1	-2	-2	-3	-4	-4	-5	-6	-7	-8	-9	-11	-14	-19	-27
51 - 100	1	0	0	0	-1	-1	-2	-2	-2	-3	-3	-5	-6	-8	-11	-13	-16	-17	-20	-23	-27	-33	-42	-56	-81
101 - 150	1	1	0	-1	-1	-2	-3	-3	-4	-4	-5	-8	-10	-13	-18	-21	-26	-29	-33	-38	-45	-55	-69	-93	-134
151 - 200	1	1	0	-1	-2	-3	-4	-4	-5	-6	-7	-11	-14	-18	-25	-30	-36	-41	-46	-54	-63	-77	-97	-130	-188
201 - 250	2	1	0	-1	-2	-3	-5	-6	-7	-8	-9	-14	-18	-24	-33	-38	-46	-52	-60	-69	-81	-99	-124	-167	-241
251 - 400	3	2	0	-2	-3	-5	-7	-8	-10	-11	-13	-20	-26	-34	-47	-55	-67	-75	-86	-99	-117	-142	-180	-241	-348
401 - 550	4	2	0	-2	-5	-7	-10	-12	-14	-17	-19	-29	-38	-50	-69	-81	-98	-110	-125	-145	-171	-208	-262	-352	-509
551 - 700	5	3	0	-3	-6	-9	-13	-16	-19	-22	-25	-38	-50	-66	-91	-106	-129	-145	-165	-191	-225	-274	-345	-463	-669
701 - 850	6	4	0	-4	-8	-12	-16	-19	-23	-27	-31	-47	-62	-81	-112	-132	-159	-180	-205	-237	-280	-339	-428	-574	-830
851 - 1000	7	5	0	-5	-9	-14	-19	-23	-28	-32	-37	-56	-74	-97	-134	-157	-190	-214	-244	-283	-334	-405	-511	-685	-990
1001 - 1250	9	6	0	-6	-11	-17	-23	-28	-34	-39	-45	-68	-90	-118	-163	-191	-231	-261	-297	-344	-406	-492	-621	-833	
1251 - 1500	11	7	0	-7	-14	-21	-28	-34	-41	-48	-55	-83	-110	-144	-199	-234	-283	-318	-363	-420	-496	-601	-759		
1501 - 1750	13	8	0	-8	-16	-24	-33	-41	-49	-57	-65	-98	-130	-171	-236	-276	-334	-376	-429	-496	-586	-711	-897		
1751 - 2000	15	9	0	-9	-19	-28	-38	-47	-56	-66	-75	-113	-150	-197	-272	-319	-386	-434	-495	-573	-676	-820			
2001 - 2250	17	11	0	-11	-21	-32	-43	-53	-64	-74	-85	-128	-170	-223	-308	-361	-437	-492	-561	-649	-766	-929			
2251 - 2500	19	12	0	-12	-24	-36	-48	-59	-71	-83	-95	-143	-190	-249	-344	-404	-488	-550	-627	-725	-856				
2501 - 2750	21	13	0	-13	-26	-39	-53	-66	-79	-92	-105	-158	-210	-276	-381	-446	-540	-608	-693	-802	-946				
2751 - 3000	23	14	0	-14	-29	-43	-58	-72	-86	-101	-115	-173	-230	-302	-417	-489	-591	-666	-759	-878					
3001 - 3250	25	16	0	-16	-31	-47	-63	-78	-94	-109	-125	-188	-250	-328	-453	-531	-643	-724	-825	-954					
3251 - 3500	27	17	0	-17	-34	-51	-68	-84	-101	-118	-135	-203	-270	-354	-489	-574	-694	-781	-891						
3501 - 3800	29	18	0	-18	-37	-55	-73	-91	-110	-128	-146	-219	-292	-383	-529	-621	-750	-845	-963						
3801 - 4100	32	20	0	-20	-40	-59	-79	-99	-119	-138	-158	-237	-316	-415	-573	-672	-812	-915							
4101 - 4400	34	21	0	-21	-43	-64	-85	-106	-128	-149	-170	-255	-340	-446	-616	-723	-874	-984							
4401 - 4700	36	23	0	-23	-46	-68	-91	-114	-137	-159	-182	-273	-364	-478	-660	-774	-935								
4701 - 5000	39	24	0	-24	-49	-73	-97	-121	-146	-170	-194	-291	-388	-509	-703	-825	-997								

**Not Permitted**

**Table 6M-5E**

**Thermal Ratings Floors: 5000 - 6000 Degree Days  
Three or More Dwelling Units/Three Stories or Less**

Net Component Area	U-Value of Component																								
	< .023	.023 to .025	.026 to .030	.031 to .035	.036 to .040	.041 to .045	.046 to .050	.051 to .055	.056 to .060	.061 to .065	.066 to .070	.071 to .090	.091 to .110	.111 to .135	.136 to .175	.176 to .200	.201 to .236	.237 to .262	.263 to .294	.295 to .335	.336 to .390	.391 to .467	.468 to .582	.583 to .770	> .770
1 - 50	1	1	1	0	0	0	0	0	0	0	-1	-1	-2	-2	-3	-4	-5	-5	-6	-7	-9	-11	-14	-18	-27
51 - 100	2	2	2	1	1	0	0	0	-1	-1	-2	-3	-5	-6	-9	-11	-14	-16	-18	-22	-26	-32	-40	-54	-79
101 - 150	4	3	3	2	1	1	0	-1	-1	-2	-3	-5	-8	-11	-16	-19	-23	-27	-31	-36	-43	-52	-67	-90	-132
151 - 200	5	4	4	3	2	1	0	-1	-2	-3	-4	-7	-11	-15	-22	-26	-33	-37	-43	-50	-60	-73	-93	-126	-184
201 - 250	6	6	5	3	2	1	0	-1	-2	-3	-5	-9	-14	-19	-28	-34	-42	-48	-55	-64	-77	-94	-120	-162	-237
251 - 400	8	8	6	5	3	2	0	-2	-3	-5	-6	-12	-18	-26	-38	-45	-56	-64	-73	-86	-102	-125	-160	-216	-316
401 - 550	11	10	8	6	4	2	0	-2	-4	-6	-8	-16	-24	-34	-50	-60	-74	-85	-98	-114	-136	-167	-213	-289	-421
551 - 700	14	13	10	8	5	3	0	-3	-5	-8	-10	-20	-30	-43	-63	-75	-93	-106	-122	-143	-170	-209	-266	-361	-526
701 - 850	17	15	12	9	6	3	0	-3	-6	-9	-12	-24	-36	-51	-75	-90	-111	-127	-146	-171	-204	-251	-319	-433	-631
851 - 1000	20	18	14	11	7	4	0	-4	-7	-11	-14	-28	-42	-60	-88	-105	-130	-149	-171	-200	-239	-292	-372	-505	-736
1001 - 1250	23	21	17	12	8	4	0	-4	-8	-12	-17	-33	-50	-70	-103	-124	-153	-175	-201	-236	-281	-344	-439	-595	-867
1251 - 1500	27	24	20	15	10	5	0	-5	-10	-15	-20	-39	-59	-83	-122	-146	-181	-206	-238	-278	-332	-407	-519	-703	
1501 - 1750	32	28	23	17	11	6	0	-6	-11	-17	-23	-45	-68	-96	-141	-169	-209	-238	-274	-321	-383	-470	-598	-811	
1751 - 2000	36	32	26	19	13	6	0	-6	-13	-19	-26	-51	-77	-108	-159	-191	-237	-270	-311	-364	-434	-532	-678	-919	
2001 - 2250	40	36	29	21	14	7	0	-7	-14	-21	-29	-57	-86	-121	-178	-214	-265	-302	-348	-407	-485	-595	-758		
2251 - 2500	45	40	32	24	16	8	0	-8	-16	-24	-32	-64	-96	-136	-200	-240	-297	-339	-390	-457	-545	-668	-851		
2501 - 2750	50	45	36	27	18	9	0	-9	-18	-27	-36	-72	-108	-153	-225	-270	-334	-381	-439	-514	-613	-751	-957		
2751 - 3000	56	50	40	30	20	10	0	-10	-20	-30	-40	-80	-120	-170	-250	-300	-371	-423	-488	-571	-681	-835			
3001 - 3250	62	55	44	33	22	11	0	-11	-22	-33	-44	-88	-132	-187	-275	-330	-408	-465	-537	-628	-749	-918			
3251 - 3500	67	60	48	36	24	12	0	-12	-24	-36	-48	-96	-144	-204	-300	-360	-445	-508	-585	-685	-817				
3501 - 3800	74	66	53	39	26	13	0	-13	-26	-39	-53	-105	-158	-223	-328	-394	-487	-555	-640	-749	-894				
3801 - 4100	81	72	58	43	29	14	0	-14	-29	-43	-58	-115	-173	-244	-359	-431	-534	-608	-701	-820	-979				
4101 - 4400	88	78	63	47	31	16	0	-16	-31	-47	-63	-125	-188	-266	-391	-469	-580	-661	-762	-892					
4401 - 4700	95	84	68	51	34	17	0	-17	-34	-51	-68	-135	-203	-287	-422	-506	-626	-714	-823	-963					
4701 - 5000	102	91	73	54	36	18	0	-18	-36	-54	-73	-145	-218	-308	-453	-544	-673	-767	-884						

**Not Permitted**

Table 6M-6E		Thermal Ratings Foundation Walls: All Degree Days Three or More Dwelling Units/Three Stories or Less																	
Foundation Wall Perimeter in Linear Feet	Exposure Above Grade in Feet	$U_w \leq 0.060$			$0.061 < U_w \leq 0.090$			$0.091 < U_w \leq 0.110$			$0.111 < U_w \leq 0.150$			$0.151 < U_w \leq 0.190$			$0.191 < U_w \leq 0.220$		
		to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth	to footing	to 48" Depth	to 24" Depth
Less than 50	1	8	1	-8	2	-4	-12	-3	-8	-15	-10	-14	-20	-16	-19	-24	-21	-23	-28
	2	7	2	-8	0	-4	-13	-6	-10	-17	-16	-18	-24	-23	-25	-31	-28	-31	-35
	3	6	3	-7	-2	-5	-13	-9	-11	-18	-20	-22	-28	-30	-31	-36	-36	-38	-42
	4	5	5	-5	-4	-4	-12	-12	-12	-19	-25	-25	-31	-36	-36	-41	-44	-44	-48
50 - 99	1	12	2	-13	3	-5	-18	-4	-11	-22	-16	-21	-30	-24	-29	-37	-31	-35	-42
	2	10	2	-12	0	-7	-19	-9	-14	-26	-23	-28	-37	-34	-38	-46	-43	-46	-53
	3	8	4	-10	-4	-7	-20	-14	-17	-28	-31	-33	-42	-44	-46	-54	-55	-56	-63
	4	7	7	-8	-6	-6	-19	-17	-17	-29	-37	-37	-46	-54	-54	-61	-66	-66	-72
100 - 149	1	20	3	-21	5	-9	-30	-7	-19	-37	-26	-35	-50	-41	-48	-61	-52	-58	-69
	2	17	4	-20	0	-11	-32	-15	-24	-43	-39	-46	-61	-57	-63	-76	-71	-76	-88
	3	14	7	-17	-6	-12	-33	-23	-28	-46	-51	-55	-70	-74	-77	-90	-91	-94	-105
	4	12	12	-13	-10	-10	-31	-29	-29	-48	-62	-62	-77	-90	-90	-102	-110	-110	-120
150 - 199	1	28	4	-29	7	-13	-42	-10	-27	-52	-36	-49	-70	-57	-67	-85	-72	-81	-97
	2	24	6	-28	0	-15	-45	-21	-34	-60	-55	-64	-85	-80	-89	-107	-99	-107	-123
	3	20	10	-24	-8	-17	-46	-32	-39	-64	-71	-77	-98	-103	-108	-126	-127	-131	-147
	4	17	17	-18	-14	-14	-43	-41	-41	-67	-87	-87	-108	-125	-125	-142	-154	-154	-168
200 - 249	1	36	5	-38	9	-16	-54	-13	-34	-67	-47	-63	-90	-73	-86	-110	-93	-104	-125
	2	31	7	-36	0	-20	-58	-27	-43	-77	-70	-83	-110	-103	-114	-138	-128	-138	-158
	3	25	13	-31	-11	-22	-59	-41	-50	-83	-92	-99	-126	-133	-139	-162	-164	-169	-190
	4	22	22	-23	-18	-18	-56	-52	-52	-86	-112	-112	-139	-161	-161	-183	-199	-199	-216
250 - 299	1	44	7	-46	11	-20	-66	-15	-42	-81	-57	-77	-110	-89	-106	-134	-113	-127	-152
	2	37	9	-44	0	-24	-70	-33	-53	-95	-86	-101	-134	-126	-139	-168	-156	-168	-193
	3	31	15	-37	-13	-26	-73	-51	-62	-101	-112	-121	-154	-162	-170	-198	-200	-206	-232
	4	26	26	-29	-22	-22	-68	-64	-64	-106	-136	-136	-169	-197	-197	-224	-243	-243	-264
300 - 350	1	52	8	-55	13	-23	-78	-18	-49	-96	-68	-91	-130	-106	-125	-159	-134	-150	-180
	2	44	10	-52	0	-29	-83	-39	-62	-112	-101	-120	-159	-149	-165	-199	-184	-199	-229
	3	36	18	-44	-16	-31	-86	-60	-73	-120	-133	-143	-182	-192	-201	-235	-236	-244	-274
	4	31	31	-34	-26	-26	-81	-75	-75	-125	-161	-161	-200	-233	-233	-264	-287	-287	-287

<b>Table 6M-7E</b>		<b>Thermal Ratings Slab Insulation: All Degree Days Three or More Dwelling Units/Three Stories or Less</b>				
Slab Perimeter (Length in feet)	R-Value of Insulation					
	R-15.0 or More	R-12.5 to R-14.9	R-10.0 to R-12.4	R-7.5 to R-9.9	R-5.0 to R-7.4	
50 - 100	3	2	0	-2	-6	
101 - 150	5	3	0	-4	-9	
151 - 200	7	4	0	-6	-13	
201 - 250	9	5	0	-7	-17	
251 - 300	11	6	0	-9	-21	
301 - 350	13	7	0	-10	-24	
351 - 400	15	8	0	-12	-28	
401 - 450	17	9	0	-14	-32	
451 - 500	19	10	0	-15	-36	
501 - 550	22	12	0	-17	-39	
551 - 600	24	13	0	-18	-43	
601 - 650	26	14	0	-20	-47	
651 - 700	28	15	0	-22	-51	
701 - 750	30	16	0	-23	-54	
751 - 800	32	17	0	-25	-58	
801 - 900	35	19	0	-27	-64	
901 - 1000	39	21	0	-30	-71	
1001 - 1100	43	23	0	-34	-79	
1101 - 1200	47	25	0	-37	-86	
1201 - 1300	51	28	0	-40	-94	
1301 - 1400	55	30	0	-43	-101	
1401 - 1500	59	32	0	-46	-109	
1501 - 1600	64	34	0	-50	-116	
1601 - 1700	68	36	0	-53	-124	
1701 - 1800	72	39	0	-56	-131	

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## Part 7

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### 7816 Testing Standards

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#### 7816.1 Scope

This Part contains a listing of testing standards which are necessary to determine compliance with performance requirements for mechanical, electrical and lighting equipment. Wherever no such reference is listed, testing shall be in accordance with generally accepted testing standards.

#### 7816.2 Public Inspection

Copies of all testing standards referenced in this Code are available for public inspection and copying upon request to the records access officer of the New York State Energy Office, Counsel's Office, Two Rockefeller Plaza, Empire State Plaza, Albany, NY 12223.

#### 7816.3 Private Publisher

Testing standards referred to in this Code that have been privately published may be obtained from their respective publisher at the following address:

- (a) Air Conditioning and Refrigeration Institute (ARI), 1501 Wilson Blvd., Arlington, VA 22209.
- (b) American National Standards Institute (ANSI), 1430 Broadway, New York, NY 10018.
- (c) Hydronics Institute (HI), Berkeley Heights, NJ 07922.
- (d) American Society for Testing and Materials (ASTM), 1916 Race St., Philadelphia, PA 19103.

#### 7816.4 US DOE

Testing standards referred to in this Code that are required by US DOE, in accordance with Title 10 Code of Federal Regulations (CFR), Part 430, Energy Conservation Program for Consumer Products may be obtained by writing to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C 20402.

#### 7816.5 Testing Standards

Table 7-1 lists the table number, table title and all testing standards appropriate to that table.

<b>Table 7-1</b>		<b>Testing Standards</b>
Table Number	Title	Testing Standards
<b>4-3</b>	Infiltration Loss for Windows	~ ASTM E283-84 - Standard Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors
<b>4-5</b>	Gas- and Oil- Fired Combustion Heating Equipment	~ 10 CFR Part 430, - Subpart A, Subpart B and Appendices N and O
<b>4-6</b>	Heat Pumps	~ 10 CFR Part 430, - Subpart A, Subpart B, and Appendix M ~ ARI Standard 240-81 - Air Source Unitary Heat Pump Equipment ~ ARI Standard 340-86 - Commercial Industrial Unitary Heat Pump Equipment ~ ARI Standard 320-86 - Water-Source Heat Pumps ~ ARI Standard 325-85 - Ground Water-Source Heat Pumps
<b>4-7</b>	Pack aged Terminal Air Conditioners and Heat Pump	~ ARI Standard 380-87 - Packaged Terminal Heat Pumps ~ ARI Standard 310-97 - Packaged Terminal Air Conditioners
<b>4-8</b>	Central Air Conditioners	~ 10 CFR Part 430, Subpart A, Subpart B, and Appendix M ~ ANSI/ASHRAE 127-1988 - Method of Testing for Rating Computer and Data Processing Room Unitary Air Conditioners ~ ARI Standard 360-86 - Commercial and Industrial Unitary Air Conditioning Equipment ~ ARI Standard 210-81 - Unitary Air Conditioning Equipment
<b>4-9</b>	Chillers	~ ARI Standard 550-88 - Centrifugal or Rotary Screw Water Chilling Packages ~ ARI Stanard 590-86 - Reciprocating Water Chilling Packages
<b>4-10</b>	Condensing Units 65,000 Btu/hr and Over	~ ARI Standard 365-87 - Commercial and Industrial Unitary Air Conditioning Condensing Units ~ ARI Standard 520-85 - Positive Displacement, Refrigerant Compressors, Compressor Units, and Condensing Units
<b>4-11</b>	Heat-Operated Cooling Equipment	~ ARI Standard 560-82 - Absorption Water Chiller Packages ~ ANSI Z21.40.1-1981 - Gas-Fired Absorption Summer Air Conditioning Appliances (including Addenda A21.40.1a-1982)
<b>4-12</b>	Service Water Heating Equipment	~ 10 CFR Part 430, Part 430, Subpart A, Subpart B, and Appendix E ~ ANSI Z21.10.3-1987 - Gas Water Heaters, Volume III, Storage with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous Water Heaters (Including Addenda Z21.10.3a-1988) ~ ANSI Z21.56-1986 - Gas-Fired Pool Heaters (Including Addenda Z21.56a-1987 and Z21.56b-1988)
<b>4-13</b>	Minimum Nominal Ful-Load Motor Efficiency	~ ANSI/IEEE 112-1984 - IEE Standard Test Procedure for Polyphase Induction Motors and Generators
<b>4-14</b>	Ballasts Efficiency Factors	~ ANSI C78.1-1978 - Dimentional and Electrical Characteristics of Fluorescent Lamps - Rapid Start Types (including Supplements C78.1a-1980, C78.1b-1986, C78.1c-1985 and C78.1d-1988) ~ ANSI C78.3-1978 - Dimensional and Electrical Characteristics of Fluorescent Lamps - Instant Start and Cold-Cathode Types (Including Supplement C78.3a-1985) ~ ANSI C82.2-1984 - Fluorescent Lamp Ballast - Methods of Measurement